Medical Library

MAY 25 1942

Archives of PHYSICAL THERAPY

Official Journal American Congress of Physical Therapy

EDITORIAL BOARD

EARL C. ELKINS, M.D., Rochester, Minn.

FRED B. MOOR, M.D., Los Angeles, Calif.

RICHARD KOVACS, M.D., New York, N. Y.

WALTER M. SOLOMON, M.D., Cleveland, Ohio. (On leave of absence, U. S. Army.)

JOHN S. COULTER, M.D., Chicago, Ill.

21st Annual Session

AMERICAN CONGRESS OF PHYSICAL THERAPY

SEPTEMBER 9, 10, 11, 12, 1942

HOTEL WILLIAM PENN PITTSBURGH, PA.

Volume XXIII MAY, 1942 No. 5

21st Annual Scientific and Clinical Session

AMERICAN CONGRESS of PHYSICAL THERAPY

September 9, 10, 11, 12, 1942

HOTEL WILLIAM PENN — PITTSBURGH, PA.

HOTEL WILLIAM PENN

¶

The annual Convention session has been reduced to a four-day period, the instruction courses occupying one half day and the scientific program the remainder of the time.

¶

Never before has PHYSICAL MEDICINE occupied such a prominent place in medical practice. Its scope in rehabilitation will be expanded even beyond its present limits.

¶

This session will feature symposia on War Injuries, Arthritis, Infantile Paralysis, and Office Practice. The various specialties will be adequately represented by well-prepared papers.

PHYSICIANS AND DULY VOUCHED FOR TECHNICIANS WHO CONTEMPLATE ATTENDING THE INSTRUCTION COURSES AND SCIENTIFIC SESSIONS SHOULD WRITE IN NOW FOR FULL INFORMATION AS TO FEES, ETC. A FEE WILL BE CHARGED ONLY FOR ATTENDANCE AT THE INSTRUCTION COURSES.

Address Executive Secretary

AMERICAN CONGRESS of PHYSICAL THERAPY

30 North Michigan Avenue

Chicago, Illinois

Contents—May 1942

Volume XXIII No. 5

ARCHIVES OF PHYSICAL THERAPY

Suite 418 — 30 North Michigan Avenue, Chicago, Illinois

Original contributions, exchanges and books for review should be forwarded to the Editorial Office. All business matters including advertising should be handled through the Executive Office, Suite 418 — 30 N. Michigan Ave., Chicago, Illinois. The statements in the manuscripts published in the ARCHIVES OF PHYSICAL THERAPY, are made solely on the responsibility of the author. The American Congress of Physical Therapy does not assume any responsibility for statements contained therein. Manuscripts accepted for publication in ARCHIVES OF PHYSICAL THERAPY, are for exclusive publication and may not be published elsewhere.

▼

OFFICERS

American Congress of Physical Therapy

A. R. HOLLENDER, M.D.,
Miami Beach, Fla., President.
FRED B. MOOR, M.D.,
Los Angeles, President-Elect.
KRISTIAN G. HANSSON, M.D.,
New York, First Vice-President.
MILAND E. KNAPP, M.D.,
Minneapolis, Second Vice-President.
WALTER S. McCLELLAN, M.D.,
Saratoga Springs, N. Y.,
Third Vice-President.
H. WORLEY KENDELL, M.D.,
Dayton, Ohio, Fourth Vice-President.
KENNETH PHILLIPS, M.D.,
Miami, Fla., Fifth Vice-President.
RICHARD KOVACS, M.D.,
New York, Secretary.
JOHN S. COULTER, M.D.,
Chicago, Treasurer.
WALTER J. ZEITER, M.D.,
Cleveland, Executive Director.
MARION G. SMITH, B.Sc.,
Chicago, Executive Secretary.

EXECUTIVE COUNCIL

Nathan H. Polmer, M.D., New Orleans, *Chairman.*
Norman E. Titus, M.D., New York, *Secretary.*
William Bierman, M.D., New York.
John Stanley Coulter, M.D., Chicago.
James C. Elsom, M.D., Madison, Wisconsin.
Frank H. Ewerhardt, M.D., St. Louis, Mo.
Roy W. Fouts, M.D., Omaha.
John Severy Hibben, M.D., Pasadena.
Disraeli Kobak, M.D., Chicago.
Gustav Kolischer, M.D., Chicago.
Frank H. Krusen, M.D., Rochester, Minn.
Albert Frank Tyler, M.D., Omaha.
Frederick L. Wahrer, M.D., Marshalltown, Iowa.
A. R. Hollender, M.D., Miami Beach, Fla., Ex-Officio.

EDITOR EMERITUS

DISRAELI KOBAK, M.D.,
Chicago.

▼

Subscriptions — In the United States, its possessions, and Mexico, $5.00 yearly; Canada, $5.50; elsewhere, $6.50 the year.

Advertising rates on application. All advertising copy subject to acceptance by publication committee.

Published monthly at Chicago, Illinois, by American Congress of Physical Therapy.
Entered as Second Class Matter January 29, 1938, at the Post Office at Chicago, Illinois, under the Act of March 3, 1879.

ORIGINAL ARTICLES

Electromyographic Studies in Poliomyelitis..... K. G. Hansson, M.D., in Collaboration with B. S. Troedsson, M.D., and Erich Schwarzkopf, Ph.D. 261

Rationalization of Peripheral Vascular Disease..... George H. Yeager, M.D. 267

Discussed by Drs. William Bierman and Andrew Taylor.

The Economic Value of Physical Therapy Following Injuries.....B. E. Kuechle 273

A Repetitive Resistance Test for Muscular Fatigue C. O. Molander, M.D., and Bertha Weinmann, M.D. 276

An Improved "Walking Chair" and "Breeches Buoy Suspension" for Severely Handicapped Infantile Paralysis Patients.....Ernest H. Bettmann, M.D. 281

Simple Workable Respirator..... Council on Physical Therapy 284

Physical Agents in Tissue Repair.....Leo Nutini, M.D. 285

•

Editorials 293

•

Medical News 295

•

Book Reviews 304

•

Physical Therapy Abstracts..... 307

•

EDITOR OF THE MONTH

WALTER M. SOLOMON, M.D.

Cleveland, Ohio

(On leave of absence, U. S. Army)

Printed in U. S. A

DON'T MISS THE HANOVIA EXHIBIT while at the convention

HANOVIA OCCUPIES BOOTH 6-0

Hanovia has assembled an imposing array of their fine Ultraviolet and Heat Therapy apparatus for display and demonstration at the A. M. A. convention in Atlantic City.

SEE THEM It will pay you to stop in at the Hanovia booth. See the many Hanovia units on display. Ask for demonstrations and learn for yourself, the reasons for Hanovia's superiority in the manufacture of ultraviolet and heat therapy units.

NEW MODELS Included in the exhibit are many new ideas, new models and noteworthy advancements. See the New Luxor "S"—the new, improved AIR-COOLED Aero-Kromayer—and other models. You'll find the Hanovia exhibit mighty interesting—from every standpoint.

BUY THEM We strongly urge you to make your purchases now. Buy the Hanovia unit—or units—which meet your requirements. At the present time we can fill your orders without delay. And while viewing our exhibit let us tell you about our Special Exchange Plan.

SPEAK UP Ask our rpresentative all about the lamps which interest you. He'll give you complete information about their operation, their usage, their effectiveness, their cost.

MOST HANOVIA UNITS PAY FOR THEMSELVES BY FREQUENT, EFFECTIVE USE

HANOVIA Aero-Kromayer Lamp AIR-COOLED
Especially designed for local application of ultraviolet irradiation, its indications are numerous.

HANOVIA Luxor "S" Alpine Lamp
A marvelous ultraviolet quartz lamp embodying all desirable features. Effective and economical to operate . . . with simplified control.

HANOVIA CHEMICAL & MFG. CO.
Dept. 306-E
NEWARK, N. J.

ELECTROMYOGRAPHIC STUDIES IN POLIOMYELITIS *

K. G. HANSSON, M.D.

In Collaboration With

B. S. TROEDSSON, M.D. and ERICH SCHWARZKOPF, Ph.D.

NEW YORK, N. Y.

This is a preliminary report on electromyographic investigation of muscles in anterior poliomyelitis.

DuBois-Raymond[1] was the first scientific investigator of the electrical properties of living tissue. In 1843 he published his investigations of muscle and nerve stimulation. This led to the discovery of the "action current," which is a negative potential traveling over the stimulated nerve and muscle and strong enough to deflect the galvanometer. For the first time it was shown that the "vis nervosa" of the earlier physiologists was of an electrical nature. DuBois-Raymond's work initiated a great amount of electrophysiologic research, which came to a standstill only when existing instruments and methods reached the limit of their sensitivity. The discovery of the electronic tube provided a higher degree of sensitivity to work with.

Piper[2] found that the electromyogram record of intact human muscle showed two types of waves: (1) large primary waves (*Hauptwellen*) and (2) numerous smaller waves (*Nebenzacken*) superimposed on the larger waves. Wiles[3] used an oscillograph and needle electrode in the central portion of the gluteus medius muscle, and found that the action current was absent in complete relaxation. It became definite when the subject was standing on both feet and showed increased height and frequency when the subject was standing on his toes. Richter[4] stated that the electromyogram from voluntary contractions is greatly altered by lesions of the anterior horn cells found in progressive muscular atrophy, poliomyelitis and syringomyelia. The frequency of the primary waves may be reduced from 50 to 70 per second to 5 to 10 per second, and each wave stands out clearly, free from *Nebenzacken*. It is evident from the work of Richter[4] and others that the frequency of the primary waves increases with the intensity of the contraction and decreases with fatigue.

Recent work by Hoefer and Putnam[5] with a cathode ray oscillograph seemed to show that the single diphasic potential wave is of short duration, in the range of one millisecond, and has a spiked character. The refractory period of the muscle potential is in the range of five-tenths millisecond, and therefore the lower motor neuron is able to carry up to about two thousand impulses per second. They counted the spike frequencies in motor unit leads and in whole muscle leads and found that frequency and amplitude increased with more effort. By using coaxial needles inserted into the muscle they found that during a gentle contraction motor unit frequency ranged between 6 and 60 per second, while the entire muscle discharges were about 300 spikes per second.

From a survey of the literature it seems rational to draw the conclusion that (1) there is an action potential in the muscles which can be detected by the electromyograph and (2) the amplitude increases with increased muscular effort. However, there is some divergence of opinion as to results obtained in electromyograms. This is undoubtedly due in part to the methods used for investigation, and it becomes more pronounced as modern sensitive apparatus is used. Today the cathode ray tube oscillograph (fig. 1) has supplanted the

* From the Department of Surgery of the New York Hospital, Cornell University Medical College.
* Read before the Alumni Association of the Hospital for Special Surgery, Oct. 31, 1941.

galvanometer. The oscillograph is capable of registering small potentials and is free from inertia.

The two input electrodes have the purpose of picking up the potentials of the muscle group under investigation. Their size was 2 by 2 cm., and tin alloy was the material of which they were made. Since electrical potentials generated by the muscle are small, an amplifier with a high amplification has to be used to make them visible on the screen of the oscillograph and on the photographic film. The ordinary radioamplifier is not satisfactory for this work because it records stray potentials, which are nearly always present, so that a clear myogram cannot be obtained. In our laboratory interference of this type was annoying in the beginning. Our problem therefore was to eliminate these disturbances. We finally succeeded in canceling the interfering potentials satisfactorily by using a different amplifier. It works with seven tubes, and its cir-

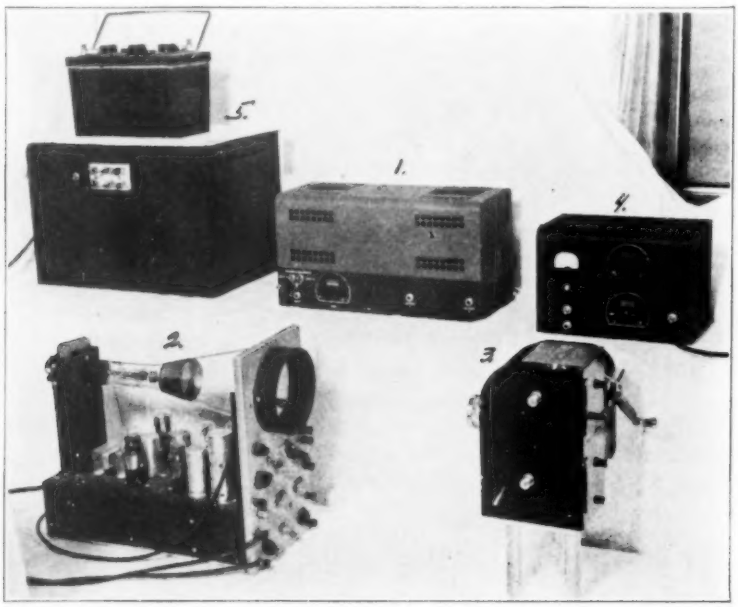

Fig. 1. — Electromyographic equipment: 1, ten stage amplifier. 2, oscillograph. 3, spring driven constant speed camera. 4, calibrating instrument. 5, batteries.

cuit is complicated. In order to obtain the differential action we fasten a third electrode to a part of the body not being moved during the experiment and connect it to ground. The two input electrodes are connected to the two input grids of the amplifier.

Owing to the peculiar circuit, the potential between the two input electrodes is, as the name differential amplifier indicates, not produced in the ordinary way but by the difference of their potentials to ground. This difference (E) is formed by subtracting the potential (E_2) of one input grid to ground from the potential E_1 of the other input grid to ground, or, expressed in a formula, $E_1 - E_2 = E$. When an equal potential exists between each grid and ground, no potential is indicated at the output of the amplifier; accordingly the formula reads in this case $E_1 - E_2 = O$. This condition usually exists in the case of stray potentials; thus if there is an interfering signal of equal magnitude between each grid and ground, such as that caused by an alternating current, it will be ruled out and cause no disturbance. As a result, the potential difference of the two input electrodes can be clearly registered. The effectiveness of our apparatus is high;

a 10 millivolt disturbance, for instance, will produce only the same potential as 10 microvolts between the input electrodes. The fundamental circuit of our differential amplifier was given by Toennies and is described in the *Review of Scientific Instruments* of March 1938.

A three step filter consisting of a condenser battery was embodied in the amplifier for the purpose of cutting down the high frequency noise due to the "Schott" effect in the input tubes and caused by the electrons leaving the cathode in irregular bursts. Since this effect is proportional to the width of the frequency band passed, the filters are useful for suppressing the "noise."

The "noise" in the amplifier with the grids grounded is lower than 5 microvolts. Furthermore, the tubes of the amplifier were suspended in rubber in order to avoid disturbances from mechanical sources.

The greatest value of this type of apparatus lies in its ability to trace alternating potentials of almost any frequency and complexity. Its construction is based on the fact that electrons in a vacuum tube can be gathered into a narrow beam which on striking a chemical coating at the end of the tube causes the chemical to become fluorescent, thus producing a spot of light. The electron beam has no weight and no inertia, and since it consists of negative charges it is readily influenced by electrical charges of any kind. Thus the electron beam can be made to move with a tremendous speed. We carry the amplified potentials to the deflecting plates of the cathode ray tube and make them measurable by the deflections of the beam. On the screen a luminescent spot appears, which later begins to oscillate in a straight line under the influence of the potentials generated in the muscle. The excursions of this spot depend on the magnitudes of the alternating potentials.

In order to visualize the curves on the screen before they are photographed, another pair of deflecting electrodes is embodied in the cathode ray tube. They are charged periodically by a constantly alternating potential, the so-called sweep potential. By its deflecting action the movements of the beam are drawn out on the screen in a luminescent curve of considerable brightness.

We measure the amplitudes of the myogram in microvolts by means of a calibrator and use the direct current. The calibrator works on the potentiometer principle and is so arranged that without any calculation potentials from 100 microvolts on in steps of 100 microvolts can be produced. It must be borne in mind that the alternating current calibration gives different results and that in order to compare two electromyograms of different origin it is necessary to mention which kind of calibration was used.

The oscillating image on the screen is photographed by a special moving picture camera. The film of the camera is moving with a constant speed, rectangular to the movements of the beam during the exposure.

We were first interested in obtaining and studying a single action potential. For this purpose we used the patellar reflex in a patient with transverse myelitis (fig. 2). One electrode was placed near the proximal end of the quadriceps muscle and the other other electrode above the patella.

We repeated Wiles' experiment using skin electrodes on a normal person. We investigated the calf muscles when he was standing without effort on both feet, when he was standing on the toes of both feet and when he was supporting his whole weight on the toes of one foot. We found a definite increase in the oscillations with the increase in the contraction of the muscles (fig. 3).

The chief problem was to evaluate the oscillations and to establish some unit of measurement. In the literature we were unable to find any previous practical way of doing this. As both amplitude and frequency of the oscillations vary, both these factors must be taken into consideration. The only way this seemed possible was by measuring the length of the curve for a certain time and then relating it to the excursion of the beam caused by a known voltage.

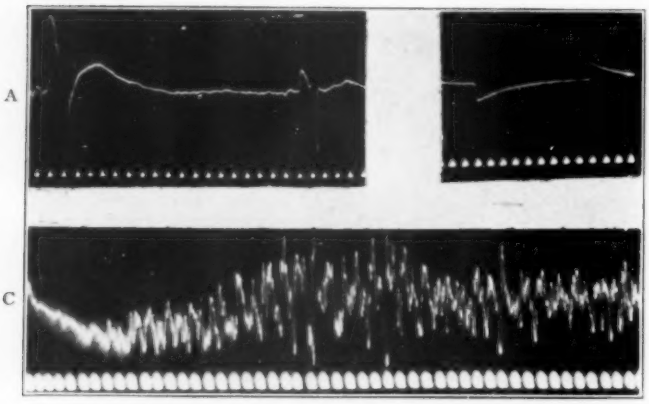

Fig. 2. — *A*, patellar reflex in decerebrate rigidity; *B*, calibration, 200 microvolts; *C*, normal contraction of right quadriceps, extension of knee.

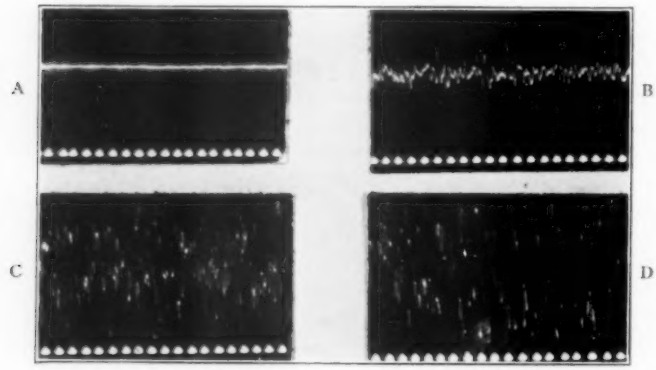

Fig. 3. — Electromyogram. Electrodes on calf. *A*, resting; *B*, standing; *C*, standing on toes; *D*, standing on toes of one foot only.

A standard deflection voltage was obtained by putting in a known voltage, for instance 100 microvolts, on the deflection plate of the cathode ray tube. A deflection caused by this voltage was photographed and measured in millimeters. We therefore know how much a deflection of 100 microvolts causes. The myogram is then measured and compared with the known deflection. This gives us as a unit of measurement, "microvolt or millivolt deflection per second." We have used the millivolt deflection, as the microvolt figures would be very high. This subject will be gone into in more detail in a later paper. In our charts:

N stands for the number of impulses per second, including every little change in direction of the curve.

V Max. is the voltage of the longest deflection.

L is the length of the curve expressed per second in millivoltage deflection obtained as described.

After about one year of this preliminary work we started examining patients with poliomyelitis. The clinical testing that has been used since 1916 and originated by Lovett[6] is probably the simplest and most commonly applied muscle test. Various other attempts have been made to evaluate muscle power, such as Kendall's[7] percentage testing. However, they all fail to overcome some subjective as well as objective factors.

It was for this reason that we tested all available patients with poliomyelitis both with the Lovett test and the electromyograph. All the films of the good, fair, poor and trace muscle power were grouped separately and studied. Also,

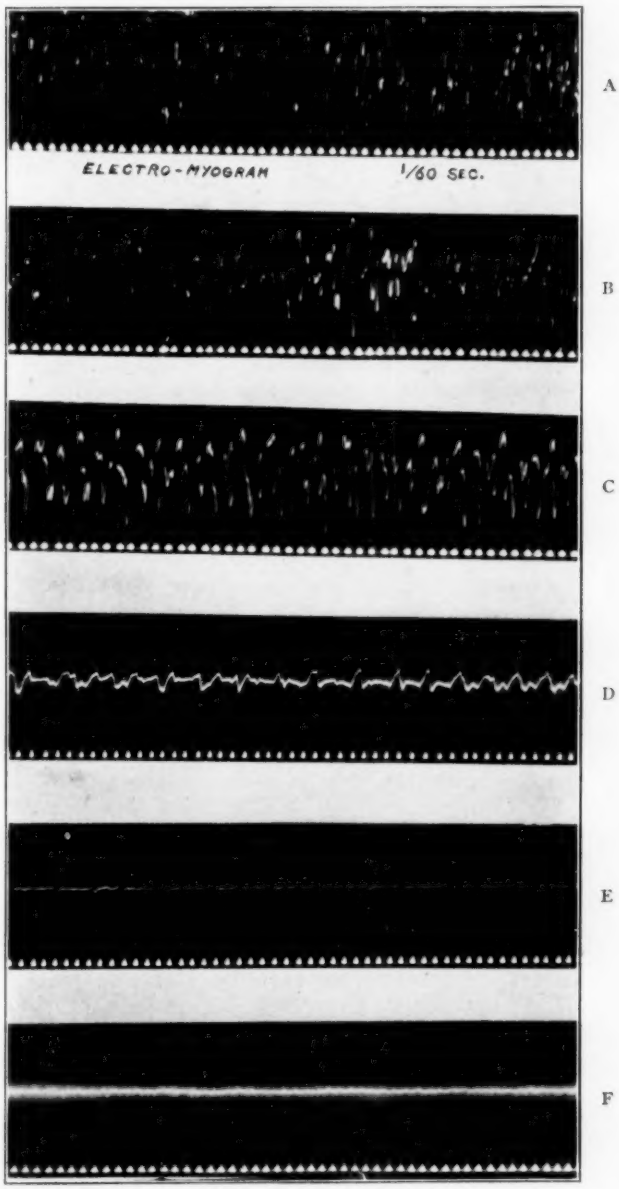

Fig. 4. — Lovett's classification. *A*, normal, maximum effort; *B*, poliomyelitis, good; *C*, fair; *D*, poor; *E*, trace; *F*, total paralysis.

the normal and totally paralyzed muscles were grouped. By this method we found definite characteristics for each group (fig. 4). By using the length of the curve modified by the millivoltage deflection we found, for instance, in tests of the quadriceps femoris muscles on different patients, the following values:

Class I. — (Lovett) normal muscle: 95 millivolt deflection = 220 impulses per second (fig. 4, *A*).

Class II. — Good muscle: 60 to 90 millivolt deflection = 150 to 220 impulses per second (fig. 4, *B*).

Class III. — Fair muscle: 24 to 60 millivolt deflection = 100 to 150 impulses per second (fig. 4, *C*).

Class IV. — Poor muscle: 6 to 24 millivolt deflection = 50 to 100 impulses per second (fig. 4, *D*).

Class V. — Trace muscle: 6 millivolt deflection = 50 impulses per second. (fig. 4, *E*).

Class VI. — Total paralysis: 0 millivolt deflection = 0 impulses per second. (fig. 4, *F*).

These figures show that in poliomyelitis there is a decrease in the millivolt deflection per second as well as in the number of impulses per second. This decrease is almost proportional to the decrease in muscle power and must secondarily represent the amount of damage present in the anterior horn cells of the cord. Owing to its extreme sensitivity this instrument may well be used not only to measure the amount of cord damage present but to check the progressive or regressive action of any treatment that is being used. With further development it may supplant present methods of muscle testing.

Conclusion

1. It is possible to pick up and study the action potentials of muscles by means of modern oscillographs.

2. The oscillogram varies with the power of the muscle to contract. This provides a definite characteristic of good, fair, poor and trace of muscle power as well as of normal and paralyzed muscles. Such an electromyogram forms an objective record of contraction.

3. By measuring the length of the curve per second and comparing it with a known millivolt deflection we obtain a definite figure for a muscle or a muscle group.

4. If this type of curve could be obtained by electrocardiograph with adequate amplification the usefulness is obvious.

References

1. Du Bois-Raymond, cited by Howell, William H.: Textbook of Physiology, Ed. 10, Chap. 4, Philadelphia, W. B. Saunders Co., 1927.

2. Piper, H.: Über den Willkürlichen Muskeltetanus, Pflügers Arch. **119**:301, 1907.

3. Wiles, Phillip: Posterior Deformities of the Anteroposterior Curves of the Spine, Lancet **1**:911 (April 17) 1937.

4. Richter, Curt P.: The Dependence of the Electromyogram from Voluntary Contractions on the Anterior Horn Cells, Am. J. Physiol. **85** (June) 1928.

5. Hoefer, Paul F. A., and Putnam, Tracy J.: Action Potentials of Muscles in Normal Subjects. Arch. Neur. & Psych. **41**:1 (Jan.) 1940.

6. Lovett, Robert W.: The Treatment of Infantile Paralysis, Philadelphia, P. Blakiston's Son & Co., 1917.

7. Kendall, H. O., and Kendall, Florence P.: Care During the Recovery Period in Paralytic Poliomyelitis, Bull. 242 United States Treasury Department, Public Health Service, 1938.

RATIONALIZATION OF PERIPHERAL VASCULAR DISEASE *

GEORGE H. YEAGER, M.D.

BALTIMORE, MD.

During the past twenty years much has been written, extensive research has been performed and special clinics have been established for the consideration of peripheral vascular disturbances. Although during this time many basic facts have been established and much progress has been made, there remains a great deal to be accomplished.

The pendulum has swung widely and frequently from one form of therapy to another, e. g., the use of vasodilator drugs, operations involving the sympathetic nervous system, fever therapy and mechanical (physical therapeutic) measures such as passive vascular exercises, intermittent venous occlusion, short wave diathermy, ion transfer and postural exercises both active and passive.

Such vacillation must mean that there remains considerable unhappiness about any form of therapy heretofore devised. In addition, it must mean that we are failing to evaluate properly and to combine various known form of therapy and that we are also failing to rationalize the disease itself.

In considering peripheral vascular diseases, it should be remembered that the problem one faces is a disturbance in the normal amount of circulating blood and that this is definitely on the negative, or on the definitive, side. This disturbance is dependent on two factors, either or both of which may be present: (1) obliterative structural change and (2) abnormal spasticity. The former is an unalterable pathologic lesion; the latter, a physiologic or functional derangement.

The student of peripheral vascular disease has widened his scope to such an extent that, more properly, the field should be called peripheral circulatory disease. A field that was chiefly limited to the study of arteriosclerotic disease, thromboangiitis obliterans and Raynaud's disease has now been broadened to include lymphatic and venous disturbances, thermal vascular derangements, essential hypertensions, the scalenus anticus syndrome and innumerable other disorders allied to the circulatory system.

There has been a multiplicity of textbooks and monographs written. In attempting to simplify and classify the various entities, most authors have overemphasized one particular form of therapy. Treatments of merit have been advocated for too wide a field, with resultant discredit to what, under other circumstances, may have been excellent procedures.

Victor Francois, of Mons, said in 1832 that everything concerning spontaneous gangrene of the extremities was in a state of distressing uncertainty. During the time which has elapsed, much has been clarified. Clinical entities have been established, and a semblance of order has emerged from the chaos. That this is true is due to intensive studies of the underlying anatomic pathology and to the approach of the problem from a physiologic basis. For attainment of a semblance of accuracy in prognosis and efficacy in therapeusis, there must be a correlation of the degree of physiologic derangement and the degree of organic disease.

---

* Read at the Twentieth Annual Session of the American Congress of Physical Therapy, Washington, D. C., September 3, 1941.

Alterations in the blood suppiy to tissues are an inevitable consequence of body involution. They are one phase of our biologic heritage. When certain tissues become involved out of all proportion to the remainder of the body catastrophe results.

Simplified classifications of peripheral vascular disease are excellent. Also, the tendency to generalize, as a quick method of diagnosis, is of value. However, both are of value only when used as a basis to study the individual problem. In other words, for a proper solution of the question, generalizations and classifications may be used only as an approach to becoming spesific and for studying the patient as an individual entity.

To be able to institute rational therapy one must be able to establish a fairly accurate prognosis. To establish a fairly accurate prognosis a careful diagnostic study must be instituted. This study must be preceded by a carefully detailed history and laboratory examination. Most important, the degree of existing vascular derangement must be determined, as well as its character. Regardless of the type of disease process suspected, the amount of organic occlusion, as well as the amount of vasospasm, should be determined. Probably the safest and most satisfactory way of determining this is by the calorimetric and oscillometric methods. Calorimetric study by means of the thermocouple is probably the most satisfactory and accurate method of determining the actual amount of spasm present.

In addition to these two diagnostic aids, plethysmography should be employed when the smaller vessels are involved.

After correlation of all findings, an evaluation should be attempted and a prognosis established. The degree of spasm should be carefully weighed against the degree of organic occlusion. It is only by this method that any rational basis of therapy may be established.

Whether the underlying condition is spastic or organic, a fair evaluation of the condition should be given to the patient. If amputation is inevitable it is much kinder to warn the patient than to subject him to long, painful and expensive forms of therapy. Postponement of issues that demand an immediate solution usually results in discrediting some form of therapy that under other circumstances might have been at least moderately efficacious.

If the prognosis is good, actual therapy should be based largely on the amount of spasm present and its relationship to the amount of organic occlusion. Regardless of which is the predominant factor, the patient should be given carefully detailed instructions as to the care and protection of his extremities. In addition, he should be urged to protect and keep his body warm during cold weather because of possible reflex influences.

Mild sedation, avoidance of tobacco and the judicious use of alcohol cannot be too strongly urged. Sedatives are indicated because of their value in helping to remove or diminish emotional stimuli. In addition, they are invaluable in aiding the patient to rest and also because of their possible vasodilating influence.

Tobacco should be prohibited because it produces a marked vasoconstriction of peripheral vessels and thereby accentuates the amount of spasm already existing. In the organic group of disorders it has a deleterious influence by affecting the collateral vessels. Its effect should be explained to the patient, as well as its probable inhibitive influence on any form of therapy instituted.

In contradistinction to tobacco, the judicious use of alcohol, unless contraindicated by an associated metabolic disorder, cannot be too strongly

urged. It is an excellent vasodilator. At times it is most effective in relieving the spasmodic pain associated with these conditions.

After the establishment of this basic regimen, further therapy must be viewed from, or correlated with, the amount of spasm present, the amount of organic occlusion and the general status of the patient.

From the spastic viewpoint, both a conservative and a radical approach must be considered. If spasm is mild and if tissue necrosis is not imminent, then certainly conservative measures are justified. The influence of rest should be emphasized, as well as general hygienic measures. Proper application of heat, because of its vasodilating quality, should be instituted. The vasodilating drugs, such as papaverine hydrochloride, theobromine, histamine and acetyl-beta-methylcholine chloride (mecholyl) are all effective in combating vasospasm. Recently, the use of sodium tetrathionate and sodium thiosulfate have been advocated for the pain associated with thromboangiitis obliterans. The effectiveness of these two drugs is apparently due to their increasing the oxygen-carrying capacity of blood rather than to any vasodilating quality.

If conservative measures fail to relieve the vasospasm and its influence is considered serious, then the next step, in a rational approach to the problem, should be the removal of the vasoconstrictor impulses by interruption of the sympathetic pathway. For the upper extremities, the cervicodorsal sympathectomy, as advocated by Smithwick, is apparently the most satisfactory procedure. The preganglionic fibers are sectioned, and the postganglionic fibers are left intact. For the lower extremities, the preferable procedure seems to be resection of the second, third and fourth lumbar ganglions. Pearl, of San Francisco, has developed a very satisfactory muscle-splitting, extraperitoneal approach to the lumbar ganglion in which there is a minimum of trauma to the patient.

The operation of ganglionectomy requires care, preparation and patience for its execution. It operates not by removal of diseased tissue but by alteration of function. It only modifies perversions of functions, the persistence of which is followed by a greater or lesser degree of organic damage. Sound physiologic findings should form the basis of such intervention. Otherwise, instead of saving an extremity it may lead to its loss. While most effective in Raynaud's disease, its use should not be overlooked in thromboangiitis obliterans, in both the involved and uninvolved extremity. In the diseased extremity it is warranted because of its influence in dilating the collateral vascular bed. In the nondiseased extremity it is indicated because of its possible influence in retarding and minimizing the extremity's almost certain involvement. In addition, it is occasionally indicated in the arteriosclerotic obliterative type of disease, in which there is a persistent and relatively high degree of associated vasospasm.

If the problem is one of organic vascular disease with little or no spasm, treatment must consist of a general supportive regimen, as previously discussed. This should be supplemented by specific therapy directed at maintaining the involved extremity by stimulation of the collateral circulation. The goal in treatment is to increase the available circulation to the affected limb.

The practice of arbitrarily lowering or elevating the involved extremity when a regimen of rest is instituted should be condemned. The optimum level for circulation should be ascertained for each patient, and this position should then be maintained. Usually the optimum level is slightly lower than horizontal.

No form of heat should be applied unless there has been a thorough sensory examination. Although the extremity should be kept warm, local applications of heat should be considered potentially dangerous. More blood and more oxygen may be required than the narrowed or occluded vessels can deliver. As a consequence, otherwise viable tissue may become devitalized. The degree of heat must not be gauged by the sensation of the patient. Unless the temperature can be carefully controlled, it would be more discreet not to use heat in any form. If it is deemed advisable and imperative, then preferably it should be achieved by reflex methods. Among the innumerable methods which may be used are immersion of an uninvolved extremity in warm water and application of heat over the abdomen.

Massage and the hot and cold contrast bath should be advised most cautiously. Both procedures are of potential danger because of the possibility of trauma and further devitalization of tissue.

Postural exercises may be a valuable adjunct. The passive type are probably indicated more often than the active, since in this type as much oxygen is not consumed by contrasting muscles. The vasoscillating bed has been found to be effective. If this type of equipment is not available, the patient may be instructed to elevate and lower his leg by means of a pulley apparatus.

Short wave diathermy if used should be administered cautiously. As with other forms of heat, it is preferable because of its reflex influence.

Ion transfer with acetyl-beta-methylcholine chloride (mecholyl) has gained some vogue and seems to be giving encouraging results. When it is used extreme care should be taken that the electrodes do not come in contact with the skin, as unpleasant burns may result. This form of therapy is apparently more effective in thromboangiitis obliterans than in any other occlusive disease. This is probably due to the fact that usually there is a higher degree of coexisting vasospasm.

Other physical (mechanical) methods of treatment consist of the use of the pressure-suction boot and of the intermittent venous occlusion apparatus either with the pressure cuff or with the vacuum cuff. Both of these methods have definite limitations, and there is still considerable disagreement as to the individual efficacy of each. Sometimes when one fails to give relief the other seems to be effective. When there is fixation of the arterial bed, the pressure-suction apparatus is without benefit. In mild arteriosclerosis it is apparently effective. In thromboangiitis obliterans it is completely disappointing, whereas intermittent venous occlusion seems to be of more significant value.

Both methods have the advantage of mechanical filling and stretching of the vascular tree. In addition, a chemical vasodilatation is caused as the result of an oxygen debt and saturation of the tissues and venous blood with oxygen.

Most circulatory diseases improve under the detailed care of those particularly interested in a successful outcome. If the natural effect of rest, position and a general supportive regimen is excluded it is often difficult to evaluate properly any one specific form of therapy. A contest is taking place —blockage of the vessels on the one hand and the development of collateral blood vessels on the other. Before credit or discredit is placed on any one therapeutic measure, a proper analysis of the case should be obtained. Any of the therapeutic agents mentioned may give disappointing results. However, these are probably due to the character of the disease itself rather than to a fallacy of the treatment instituted. One is dealing with the problem

of a progressive organic disease on the one hand and the development of a collateral circulation on the other. The capacity of the latter is limited.

Other therapeutic adjuncts consist in the use of the intravenous injections of hypertonic solutions and of artificial fever produced by injections of typhoid vaccine. Both forms of therapy have found their widest vogue in the treatment of thromboangiitis obliterans. In arteriosclerotic diseases these types of treatment are probably without benefit and actually may cause irreparable damage.

The use of heparin or a similar derivative may prove to be of value in thromboangiitis obliterans. The propagation of the lesion, which is inflammatory in character, probably may be retarded in this manner. However, at present its use is impractical except in the treatment of acute fulminating lesions. Possibly when an effective anticoagulant that may be administered by mouth is developed, a great step forward in solving the problem of this disease entity will have been accomplished.

Summary

Rational treatment of peripheral vascular disease is dependent on:

1. A more careful consideration of each patient as a specific entity.
2. A thorough diagnostic study.
3. Consideration of the problem from two phases: (*a*) spasm and (*b*) organic occlusion.
4. The correlation of each phase with the other and treatment from the viewpoint of removal of the spastic element and development of the collateral circulation.

References

1. Allen, Arthur W.: Peripheral Vascular Disease, Arch. Surg. **40**:161 (Feb.) 1940.

2. de Takats, Geza: Sympathectomy for Peripheral Vascular Disease, Arch. Int. Med. **60**:990 (Dec.) 1937.

3. ————: Management of Peripheral Vascular Disease, Arch. Phys. Therapy **19**:88 (Feb.) 1938.

4. Lewis, Dean: Lesions of the Blood Vessels of the Extremities, South. M. J. **20**:421 (June) 1927.

5. Ochsner, Alton, and De Bakey, Michael: The Rational Consideration of Peripheral Vascular Disease, J. A. M. A. **112**:230 (Jan. 21) 1939.

6. Pearl, Felix L.: The Management of Chronic Occlusive Peripheral Arterial Disease, Am. J. Surg. **43**:106 (Jan.) 1939.

7. Smithwick, Reginald H.: Modified Dorsal Sympathectomy for Vascular Spasm (Raynaud's Disease) of the Upper Extremity, Ann. Surg. **104**:339 (Sept.) 1936.

8. Wright, Irving: Conservative Treatment of Occlusive Arterial Disease, Arch. Surg. **40**:163 (Feb.) 1940.

Discussion

Dr. William Bierman (New York, N. Y.): All the methods of treatment employed today in the care of peripheral vascular disease are symptomatic. The essential etiologies are unknown. This accounts for the diversity in therapeutic technics. The evaluation of treatment is, at times, difficult because of spontaneous improvement. Numerous studies have been made to indicate objectively the effect of drugs and of physical measures advised for the treatment of peripheral vascular diseases on the circulation of the extremities. The clinician should be guided by this positive evidence. Corroboration of the value of a given treatment by means of objective findings lends additional support to clinical impressions. Such objective determinations are easily arrived at by the observation of temperature studies of the skin surface and of the muscles of the extremities. These tend to prove the value of some of the procedures advised, to disprove the value of some others, and to indicate the limitations of still others.

The important consideration which appears to be frequently overlooked is that the circulation of the skin of the extremities and the circulation of its interior are independent. For example, removing the vasoconstricting influence of the sympathetic nerves will cause a relaxation of the vasospasm and therefore increase the

circulation in the skin, but it produces no similar change in the muscles of the leg. This would indicate that surgical measures which remove the sympathetic control are unable to influence the circulation of the muscles of the leg and can therefore cause but little if any change in the symptoms which are due to an inadequate supply of blood to the muscles of the leg. When one considers the severity of the operative procedures and the fact that the same changes may be accomplished by simpler means, one questions the advisability of such surgery. Measures which cause an increase in the circulation of the skin are of particular value in the presence of trophic disorders of that organ. Thus, a procedure such as intermittent venous occlusion may help to heal ulceration of the skin occurring in thromboangiitis obliterans. However, it will not influence the circulatory deficiencies of the muscles.

Dr. Andrew Taylor (Charlotte, N. C.): My observation about seven years ago of Dr. Yeager's work in Baltimore was my first interest in the rapidly developing field of peripheral vascular disease. His sound approach to the numerous problems involved makes it appear almost easy. He has pointed out the desirability of correlating the various observations from the patient's history and from the general examination with the results of special functional tests in order that a prognosis may be reached early. I wish to emphasize the careful consideration of all of these factors and to warn against placing too much dependence on any one test.

For instance, the oscillometer is useful in confirming a diagnosis, but it's use to establish a prognosis or to select a form treatment is often misleading. One case with a poor oscillometric reading may recover, while another showing much better findings, according to this test, will fail to show any benefit by the same treatment.

As for the calorimetric test or the Landis test, this test sounds fairly easy and dependable, but it is difficult to carry out, especially where one does not have an air-conditioned room. In the South during the summer time it is hard to get the temperature of the room down low enough to make a satisfactory skin temperature test. Then, if the calorimetric test is done and the vasomoter index is relatively high, the prognosis is good regardless of the amount of organic destruction of the major vessels and almost any accepted type of treatment will benefit these cases. Hence, after determining the vasomotor index, the treatment is not definitely guided because in any event there is a good outlook.

Suppose we have, for example, a case of thromboangiitis obliterans. The oscillometer readings indicate only a moderate obstruction of the major arterial pathways and the calorimetric test shows that a high vasomotor index is present. A sympathetic ganglionectomy would probably give dramatic relief to such a patient. This type of case would also respond favorably to conservative management. If they do not stop smoking they will have recurrence.

In arteriosclerotic cases it seems to me the prognosis is still difficult. The majority are so near the borderline that one must try simpler methods of physical therapy before one can tell in any individual case whether or not there will be benefit. Here, again, we have to take the individual patient and his history, the duration of the condition and all of the clinical findings, the color of the skin in different positions of elevation, on the level, and in dependency, and consider these observations as much as one does the specific circulation tests.

THE ECONOMIC VALUE OF PHYSICAL THERAPY FOLLOWING INJURIES

B. E. KUECHLE

Vice-President and Claim Manager
Employers Mutual
Liability Insurance Company of Wisconsin

WAUSAU, WISCONSIN

No physician or surgeon today is adequately equipped and trained to give treatment in injury cases unless he is familiar with those physical therapy measures that will assist in restoration of function. He need not actually administer physical therapy himself, but he must know when massage and active exercise should start after every type of fracture; when the necessity for heat, massage and muscle training exercises is indicated in the treatment of nerve and tendon injuries, and when heat of various types is required.

It has been gratifying to us in the insurance field to witness the gradual but steadily increasing growth of physical therapy not only in industrial but in private practice. One is convinced that within a few years most hospitals will be equipped to render physical therapy as a supplement to other medical and surgical procedures and that communities will have physical therapy centers where treatment can be given to ambulatory patients. The entire program should be developed to effect as complete a functional restoration in every disability case as is humanly possible.

Naturally, the business interest of insurance in physical therapy would be on the basis of its economic value. In other words—are persons injured in industry returned to work more promptly, and is the ultimate permanent disability reduced by physical therapy to such an extent that the cost of treatments pays good returns in compensation payments saved?

However, there is no statistical evidence showing that compensation payments would be higher because of both increased disability periods following injury and higher allowances for permanent disability if physical therapy were not employed. Nevertheless, certain facts are taken as self-evident in spite of unavailability of statistical proof. One or two illustrations will indicate what I have in mind. No one can say positively, for instance, that a certain successful person achieved his place in the business world because of a college education. Nevertheless, it is known that advanced education does contribute materially to the success and advancement of most persons who have had its advantages. Undoubtedly it is impossible to prove statistically that a good advertising program of a business organization pays handsome returns. Many institutions which do not advertise seem to be tremendously successful. Nevertheless it is accepted as a self-evident truth that advertising is a good investment.

The Employers Mutual is so completely sold on the economic value of physical therapy following industrial injuries that in 1928, because no outside facilities were available, it established a physical therapy department in Wausau, Wis., with two trained physical therapy technicians. From that time through Dec. 31, 1940, 85,418 treatments were given to 3,624 patients. To supplement other facilities available in greater Chicago, a physical therapy department was established there early in 1940, and up to Dec. 31, 1940, 5,181 treatments were given to 388 patients.

The types of injuries treated in our physical therapy department at Wausau are shown in the following tabulation:

Fracture	39,432	Dislocation	2,672
Contusion	11,277	Nerve injury	1,725
Laceration	4,501	Burn	730
Amputation	3,810	Arthritis	730
Infection	3,294	Strain	2,080
Sacroiliac strain	5,283	Removal of semilunar cartilage	1,022
Sprain	3,070		

The remainder of the treatments making up the grand total of 85,418 consisted of miscellaneous types of injuries. The distribution at Chicago was somewhat similar; out of the total number of treatments rendered during 1940, 2,245 followed fractures.

Prior to the establishment of our own physical therapy department, physical therapy was not as extensively employed in our cases, although we did to a small extent make use of the Junior League Curative Workshop in Milwaukee.

The compensation law in Wisconsin—and similar provisions are found in the compensation laws of other states—provides that the employer after injury to an employee shall "supply medical, surgical, and hospital treatment, medicines, medical and surgical supplies, crutches, artificial members and appliances, as may be reasonably required to cure and relieve from the effects of the injury." We feel this legislative mandate goes beyond the mere furnishing of medical and surgical relief as these terms are commonly understood by laymen. In our opinion, adequate surgical treatment includes reconstructive operative measures. In the light of modern medical science, we believe adequate medical attention means the adaptation, whenever indicated, of those adjuncts of treatment that will assure functional restoration or at least improve the economic status of the individual as a wage earner. From a strictly surgical standpoint, such physiologic results cannot be obtained if the attending physician or surgeon is content with the immediate surgical result or if he loses interest in the case before he is assured that a satisfactory functional result has been attained. A patient with severe burns cannot be left to his own devices to overcome contractures due to scars. Good surgical treatment does not comprise merely a perfect reduction of a fracture and treatment until solid union has occurred if, in the meantime, adjacent joints remain unprotected or uncared for and no consideration is given to maintaining proper muscle tone. On the other hand, even in the hands of experts, physical therapy treatments will not prove adequate unless the attending physician properly instructs the technician in great detail about the type of treatment that is to be given and the length of time the treatment is to be continued. Constant close cooperation between the physician and the technician is necessary, because the original prescription must be revised by the physician to meet the immediate needs of the patient as the treatment progresses. The physician who is really interested in his patient's welfare should never write an order to a lay technician to give the patient "some physical therapy." That is just about as ridiculous as though he were to write a prescription to a druggist to give the patient "some medicine," and the results are likely to be equally unsatisfactory. Even orders for baking, massage and exercise with no detailed instruction are likely to prove futile.

It is such situations that have brought physical therapy into bad repute with many insurance companies and even with some industrial boards. Extensive physical therapy without worth while results discourages not only

the patient if he has to pay the bill himself but also the employer and the insurer in industrial cases.

Manufacturers of lights and other electrical apparatus have for years been selling equipment to the medical profession by such high pressure methods that many physicians think that physical therapy refers only to such treatment as it is possible to give with these machines. One can treat a stiff joint for years with the best therapeutic lamp invented and never secure one bit of functional restoration, whereas the early use of heat, gentle massage and daily, gradually increasing passive and, above all, active exercises will, in the majority of cases, result in full restoration of function. Although these machines have their place in the hands of skilful technicians, they are not necessary for the simple physical therapy procedures that are required in practically 95 per cent of cases.

Physical therapy accurately prescribed and intelligently administered is a necessity in efficient treatment and the speeding up of functional restoration after injury. As my previous figures have indicated, fractures, sprains, dislocations, contusions and lacerations make up a large percentage of industrial injuries. The principles of physical therapy are fairly similar in the treatment of these various conditions, because the conditions differ mainly in the degree of trauma. There may be damage to the muscles, ligaments, tendons, nerves, vessels and other soft tissues. Any agent that promotes nutrition aids repair. Massage is used early to maintain nutrition and circulation in the injured part. If there has been a hemorrhage, the application of heat is postponed until danger of further hemorrhage is past. Then heat in its various forms may be applied as a preparation for massage. Active motion is the natural physiologic function of muscles and joints, and therefore it is the best physiologic stimulus to their proper nutrition and normal use. Active motion is the only agent that directly increases muscular power, and its dose should be regulated by the tolerance of the patient.

A physical therapy department in a hospital is a particularly fortunate arrangement, as physical therapy should start in many instances while the patient is still in the hospital and continue during the early days of his recovery. A hospital using a physical therapy technician should have her check the position of the bed and the activity in all cases from the time the patient enters the hospital even if he is not ready for the usual physical therapy procedure. Such a measure will materially cut down the cost of corrective work.

Frequently, however, even after good surgical treatment and well directed physical therapy, the patient fails to respond to treatment until his interest has been aroused and his ambition renewed by occupational therapy. Work is one of the greatest therapeutic measures and one that is often neglected. It takes the mind of the patient off his disabled state; it improves morale and wakens or renews interest in creating something, and it gives promise of future usefulness to one whose future seemed hopeless. It is, therefore, extremely essential that the physician and the technician acquaint themselves with the nature of the patient's employment prior to his injury. Frequently, in industrial cases, opportunities for employment at light work will be even more productive of good results than continued physical therapy alone.

Various estimates have been made as to the number of industrial cases in which physical therapy is essential. Some authors have given estimates as high as 75 per cent, but I feel that, while physical therapy may be comforting in 75 per cent of cases, it is probably not essential in more than 10

per cent of all industrial cases, although with certain types of injuries, such as fractures, one would almost consider it essential in 100 per cent of cases.

Before stating what I consider certain essential qualifications of a skilled technician, I should like to summarize a few "musts" for physicians:

1. Don't order physical therapy unless it is really indicated.
2. Treat the pathologic condition.
3. Use the proper kind of treatment.
4. Stop treatment when progress ceases.
5. Employ work therapy as soon as possible.

As I have previously stated, I believe the time will come when each hospital will have its own physical therapy and its own occupational therapy department under technicians specially trained for their work, and more depends on the technician than on the physical properties in such departments. Not only must the technician have the educational and scientific background for carrying on her work as a technician, but she must know the psychologic status in each case. She must have great persuasive powers, for she will have to convince most patients that work is good for them. She must know how to lead the patient gradually from passive exercises to light diversional occupations and then to occupations with a purposeful end. Physical therapy and occupational therapy must dovetail.

With such a cooperative program it will be found generally, as it has been found by us, that physical therapy pays.

A REPETITIVE RESISTANCE TEST FOR MUSCULAR FATIGUE *

C. O. MOLANDER, M.D.

and

BERTHA WEINMANN, M.D.

From the Department of Physical Therapy, Michael Reese Hospital

CHICAGO

The necessity for precise means of measuring and recording changes in function, range and strength of muscles has become more and more evident in recent years. Objective evidence of altered functions in the place of subjective observations is of importance not only for assaying the changes during different stages of disease and recovery but also in evaluating the effects of different methods of treatment. Thus accurate objective tests furnish a valuable aid to diagnosis, prognosis and treatment.

In the Physical Therapy Department of Michael Reese Hospital, in the process of following up patients who have had poliomyelitis we employ functional muscle tests, range of motion tests (for which a simple recording system[1] has been described by us recently), muscle strength tests and the test for fatigue which we will describe here.

In a stricter sense all tests are functional tests, but this term is applied usually to the test developed by Dr. R. W. Lovett and W. G. Wright. The functional muscle test has proved valuable as a qualitative evaluation. No instru-

* Aided by a grant from The National Foundation for Infantile Paralysis, Inc.

ments are used for this test. The muscles are graded solely according to their function. They are classified according to their ability to perform their movements against resistance, against gravity and with gravity eliminated and according to their power to perform the full or partial range of motion. They are graded as normal (5), good (4), fair (3), poor (2), with trace of power (1) or completely paralyzed (0). The muscle or group of muscles able to function against gravity is graded 5 or 5 minus or 4 plus, but this test offers no measure of the ability of the muscles to tolerate a higher or lower degree of resistance.

If in addition to this test the test of strength (of Lovett, Martin and Schmier) is applied, the degree of resistance offered by the patient can be measured in pounds. Lovett and Martin[2] in 1916 described spring balances for this purpose which have been used successfully for many years. This method has been improved recently by Schmier[3] by using a set of three spring balances — 6 pound, 50 pound and 100 pound scales — and by adding different appliances and an automatic inker to the scales. This test has the advantage of being a quantitative test in estimating the power of resistance of muscle groups. Gain or loss in different stages can be measured and recorded in pounds.

Fig. 1. — Testing the quadriceps.

But there is need in many cases of testing not only for muscle strength but for fatigue. By repeating the tests for strength in succession we have noted that the resistance decreases at a variable rate which is dependent on the state of the tested muscles. In order to obtain permanent and accurate evidence of the presence or absence of fatigue and of the decline of resistance we have undertaken to record such repetitive tests (pulling up to eight to fifteen times within three to five minutes in one recording). New charts were printed in order to record this number of efforts in one test. The charts are graduated in pounds and half pounds, similarly to the strength charts. There are different types of charts for the 6 pound, the 50 pound and the 100 pound scale, each providing sufficient space for ten to fifteen recordings. There is additional space for the patient's name, the muscle group and the date of the test. The scales used are the spring balances devised by Schmier.

The test is performed as follows (fig. 1): The patient is placed on a padded table in a reclining position. In cases of poliomyelitis it is important that the parts not tested be supported by their usual splints and braces or kept in position by sandbags, while the parts to be tested are supported or guided by an assistant. The assistant also helps to maintain fixation of the trunk to prevent it from moving when the arm or leg is moved and aids in readjusting the patient's posi-

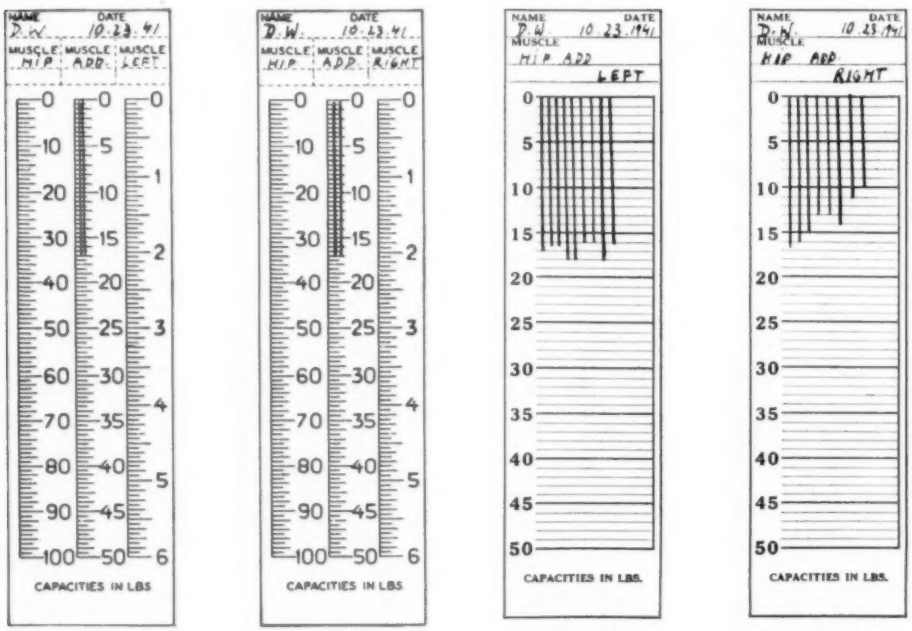

Fig. 2A Fig. 2B Fig. 2C Fig. 2D

Fig. 2. — *A*, *B*, strength tests of right and left hip adductors show no difference; *C*, *D*, fatigue tests reveal weakness of right side, showing decline of resistance.

tion after each test. The loop of the spring balance is slipped over the extremity. The position of the examiner and the assistant and the direction of the traction are determined by the type of motion examined in the test. The patient is told to contract the group of muscles being examined and to try to keep the limb in the position set for testing. As the examiner pulls the scale the inker of the charts moves, and it comes to a stop at the moment the patient stops offering resistance. The test is repeated on each muscle group eight to fifteen times, with intervals of about twenty seconds between tests. The intervals are used to readjust the position of the patient, the loop and the automatic inker on the chart. The record thus obtained registers in pounds the strength used in overcoming the patient's resistance and indicates the results of the repeated efforts in one test.

The advantages of this repetitive test are as follows: 1. A recording is obtained of the average strength of a group of muscles. 2. The evidence of the variability of resistance is shown. 3. The evidence of the presence or absence of fatigue is indicated by the presence or absence of decline of resistance. 4. The rate of fatigue is shown by the decrease of strength in successive efforts, calculated as a percentage of the maximum strength.

In analyzing some of our charts thus obtained we note various differences between the reaction of the stronger muscles and that of the weaker ones. For example, when the hip adductors of the right and the left side of one patient (who had mild poliomyelitis) are compared, the single test for strength (Lovett,

Schmier) shows identical strength on the two sides, as shown by figure 2*A* and *B*. But the repetitive test recorded according to our charts shows a considerable difference between the left (strong) side and the right (weak) side in various respects. The strong side was represented by figure 2*C* and the weak one by figure 2*D*. In figure 2*C* the initial strength is shown to be 17, the average strength 17, the maximal strength 18 and the minimal strength 16. So the variation between maximal and minimal strength was 18:16, a small percentage (about 11 per cent). On the weak side (fig. 2*D*) the initial strength was also 17 pounds, the average strength was 14, the maximal strength was 17 and the minimal strength was 10 pounds. The variation between maximal and minimal, 17:10, was large, more than 40 per cent. The decline from 17 to 10 on the graph makes an almost straight line, forming a steep angle with the horizontal. It is characteristic also that the maximal strength was attained only in the first effort and was not reached again in later efforts because of the increasing fatigue. On the strong side (fig. 2*D*) the maximal strength was not reached in the first effort; it was attained later and reached not only once but several times (effort 4, 5 and 8). There was no progressive fatigue.

These differences are also shown in fig. 3*A* and *B*. These charts indicated the function of the adductor muscles of the arms of the left and the right side of another patient who had poliomyelitis. This test was performed about one

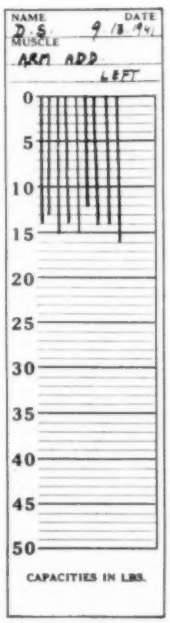

Fig. 3*A*

Fig. 3*B*

Fig. 3. — *A*, *B*, difference in strong (left) and weak (right) arm adduction of one patient.

Fig. 4*A*

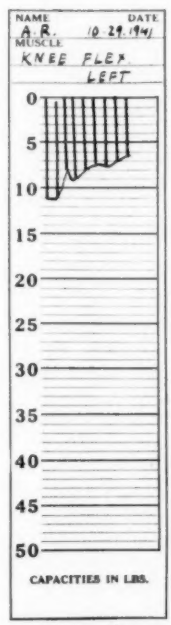

Fig. 4*B*

Fig. 4. — *A*, *B*, improvement of one muscle group. Test *B* was done six weeks later than test *A*. Line connecting tops illustrates decline of resistance.

year after the onset of the illness. The left arm (fig. 3*A*) had been affected slightly, and the right one (fig. 3*B*) more severely. The stronger (left) arm (fig. 3*A*) showed an initial strength of 14 pounds; the maximal was 16, the minimal 12 and the average 14 pounds. The variation between maximal and minimal strength was 16:12 (25 per cent). In the weaker (right) arm (fig. 3*B*) the initial strength was 13 pounds, the average was 10, the maximal was 13 and the minimal was 8 pounds. The variation between maximal and minimal strength, 13:8, was about 40 per cent. Here again, in the weak arm the initial effort was

the strongest one and was not reached later. On the stronger side the maximal strength was attained in later efforts, not in the first, and there was no progressive fatigue. In the chart taken for the stronger arm the line connecting the recordings of the single efforts is nearly horizontal, while on the weaker side the decline of resistance is illustrated by the steep angle of the connected tops.

An illustration of improvement of a muscle group is shown by two tests done on the same patient six weeks apart. These charts (fig. 4*A* and *B*) record the flexors of the left knee. The patient had had poliomyelitis and was tested about one year after the onset of illness. The test recorded in figure 4*B* was the later test; it showed an initial strength of 11 pounds, as compared with an initial strength of 7 pounds in the earlier test. The maximal strength in the later test was 11, as compared with 7 in the earlier one. The variation between the maximal and the minimal strength was 11:6½ in the later test and 7:3 in the previous one. The average was 8 pounds, as shown in figure 4*B*, and 5 pounds, as shown in figure 4*A*. Both tests indicate the presence of progressive fatigue, but the gain in strength is indicated by the higher values of recording of the single efforts in the later stage and by the smaller rate of decline in the later test (40 per cent, compared with 60 per cent).

Summary

The repetitive test, developed by us, furnished:

1. Objective evidence not only of the single effort but of the average, maximal and minimal strength of a number of successive efforts recorded in pounds.

2. A method of determining the variability of resistance which appears in successive tests as deviation from the maximal strength and can be calculated in percentage of the maximal strength. This is a measure of the fitness of the muscle. The stronger the muscle, the less deviation is seen. The absence of fatigue is indicated by a relative constancy of the efforts.

3. A measure of the rate of fatigue, shown as the angle formed by a line connecting the recording of the single efforts and its inclination to the horizontal line. The angle increases with increasing fatigue. The angle of inclination can be used as a rough index of fatigue.

4. A method of evaluating considerable differences of reaction in groups of muscle which previously had a normal rating of 5 if tested as to resistance but which still may show a subnormal reaction in their fatigue curve.

It is of importance in this as in any test that in repeated examinations of the same muscle group on different days the conditions during examination be exactly the same. The position of the patient, of the assistant and of the supporting table, boards and splints should be the same in each test. The examiner should be the same person.

In infantile paralysis the fatigue test, like Lovett's test of strength, may be used only on fairly strong muscles. The muscles should have the necessary amount of strength to work against the resistance. Thus it is employed at later stages of recovery or to groups of muscle only slightly affected.

This test is not supposed to substitute but is to supplement the other tests, which we use as well, each for its special purpose.

References

1. Molander, C. O., and Weinmann, Bertha: New Chart System for Recording Joint Measurements, Physiotherapy Rev. **21**:88 (March-April) 1941.

2. Lovett, R. W., and Martin, E. G.: Spring Balance Muscle Test, Am. J. Orth. Surg. **14**:415 (July) 1916.

3. Schmier, A. A.: Muscle Tests for Poliomyelitis Cases. Attachment of Permanent Record, J. Bone & Surg. **21**:475 (April) 1939.

AN IMPROVED "WALKING CHAIR" AND "BREECHES BUOY SUSPENSION" FOR SEVERELY HANDICAPPED INFANTILE PARALYSIS PATIENTS

ERNEST H. BETTMANN, M.D.

Blythedale Hospital for Crippled Children

VALHALLA, N. Y.

The usual "walking chair" gives sufficient stability to the patient to enable him to carry his body weight with his arms supported by arm crutches. If both lower extremities and part of the back muscles are involved, the strength of the arm gives way easily and the patient needs manual support or has to resort to a wheel chair. To enable him to attend to his daily standing and walking exercises with temporary rest in a walker, an improved walking chair was devised.

It has three main parts: an adjustable head suspension (*1* in figure 1) with a Glisson sling, a "breeches buoy" (*2*) with a lateral adjustable ring suspension, which is incorporated in a short or long hip spica previously

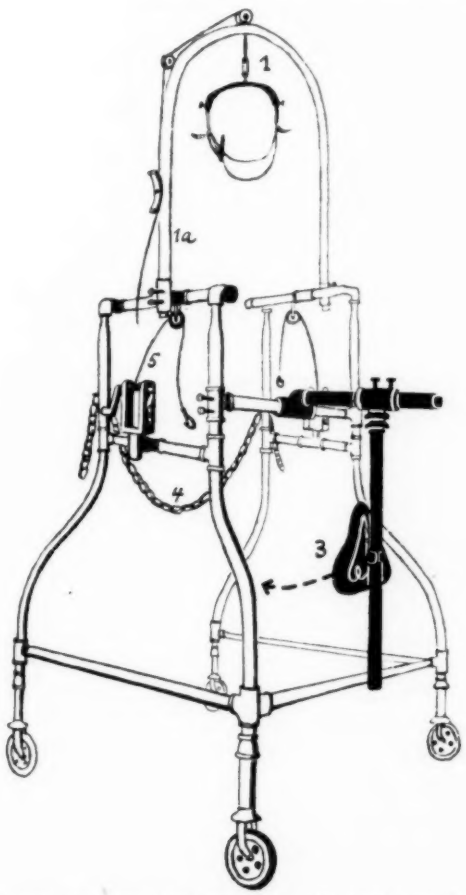

Fig. 1. — Walker with adjustable head suspension, seat attachment and hip suspension.

applied, and a removable seat (*3*) for temporary rest periods. The seat consists of a bicycle saddle attached and movable on a 12-inch long water pipe tube, which ends in a cuff, gliding on a 19-inch long horizontal tube. By means of another cuff, which connects the 19-inch tube at the end with the frontal transverse bar of the walker, the saddle attachment, which hangs down in front of the walking patient, can be adapted to his buttocks by being swung backward and fixed to a chain hanging across the rear bars of the walker (*4*). By shifting the saddle and lowering or raising the chain, the most comfortable sitting position is obtained, which enables the patient to rest his arms and legs.

The "breeches buoy" (fig. 2), which is patterned on the life-saving buoy by means of which sailors on stranded ships are carried on a rope to

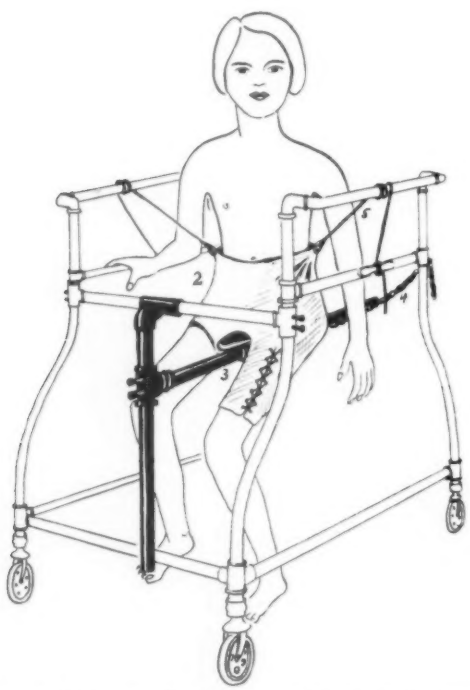

Fig. 2. — Walker with adjusted seat and breeches buoy suspension.

the shore, consists of a pelvic bandage like a man's battling vest, individually made from heavy sail cloth. There is one large curtain ring attached to each side for bilateral pelvic suspension, which is carried out by wires clipped to these rings, running over two trolleys attached to the upper side bars of the walker and leading to pulleys on each side, by which the patient can easily be lifted and kept on the necessary level.

In order to avoid pressure in the genital region the buoy is cut out in that region and also padded with sponge rubber or felt along the inner borders and where there will be contact with the ischial bones.

The buoy is extended down to the knees and reinforced with an outer bar in cases in which immobilization of one hip is necessary. This modification has laces for opening and closing of the thigh piece (fig. 2).

The buoy can be used in combination with a brace for better walking.

Before the breeches buoy is put on a plaster spica is applied for a trial period. This includes one knee when locking of one hip and one knee joint

is required to provide stability. The lateral ring supports are attached to the plaster cast by means of incorporated ropes. This procedure makes it possible to lift the patient and keep him upright and to study the standing and walking possibilities.

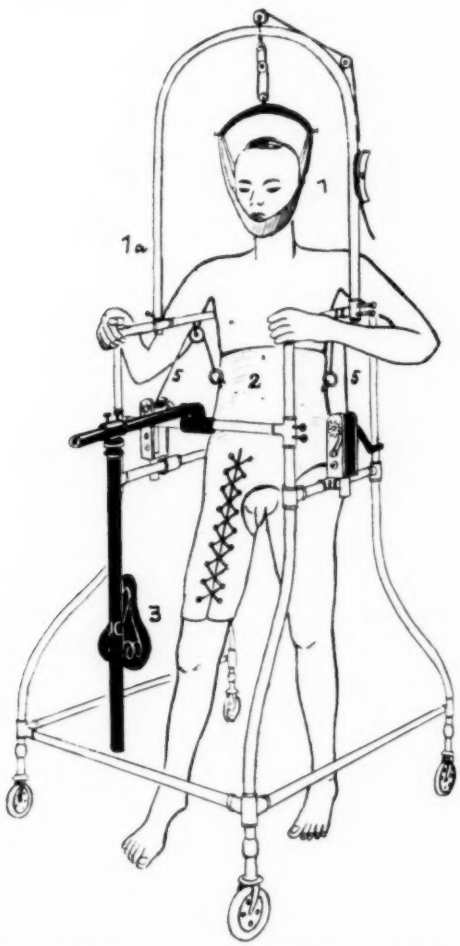

Fig. 3. — Walker with head-hip suspension. (Temporary hip spica with lateral ring attachment and pulley lift.)

The head suspension consists of a Glisson sling attached to a trolley in the center of a 22-inch high adjustable suspension frame (*1a* in figures 1 and 3), which bears on one side the clamps for fixing the suspension cord.

The head suspension is used by patients to whom the breeches buoy does not give sufficient suspension and can sometimes be discarded when the patient becomes more adapted to the use of his muscles.

SIMPLE WORKABLE RESPIRATOR *

COUNCIL ON PHYSICAL THERAPY
HOWARD A. CARTER, Secretary
CHICAGO

An epidemic of poliomyelitis of major proportions struck the Northern peninsula of Michigan in the fall of 1940. Within a period of a few days 90 patients were rushed by train, by automobile and even by airplane into St. Luke's Hospital at Marquette, Mich. The respiratory type of paralysis was unusually prevalent among the affected children. Only one respirator was available, and at least 12 children needed assistance.

The superintendent of St. Luke's Hospital appealed to Mr. M. K. Reynolds, one of the trustees, for help, insisting that with his engineering ability he surely could devise some type of temporary respirators that could meet the problem until regular respirators could be obtained. The machine shop which Mr. Reynolds maintained at his private boat yard immediately was turned into a respirator laboratory. Cabinet makers and machinists were called in and within a few hours crude but workable respirators were delivered to the hospital. Their first homemade respirator consisted of two gasoline drums welded together and fitted with a hand manipulated valve; this apparatus was attached by a hose to the one available large respirator as a "trailer." Two children were placed in this "trailer," and women of the community worked the valve by hand constantly for thirty-six hours, or until a mechanical automatic valve was constructed. The thrilling story of this volunteer community effort to meet the respiratory problem when commercial respirators were not available was published in the December 1940 issue of *Hygeia*.

Since that article was published, Mr. Reynolds has received numerous letters and many personal visits from representatives of remote communities where poliomyelitis has broken out and where the respiratory problem has become as acute as it was in Marquette. For example, an epidemic has been raging in Alaska. Respirators were needed. An appeal came to Mr. Reynolds and he sent photographs and working plans for making this simple wooden respirator which had proved so valuable in the Marquette epidemic. In his opinion these respirators could be made within a few hours in any school manual training shop, should the emergency arise.

That there is a great need for emergency respirators was recognized by Drs. Phillip Drinker and Edgar Roy, who published specifications for making such an apparatus in the *Journal of Pediatrics* (13:71 [July] 1938). This need is also evident from the urgent requests which have come to the office of the Council during the past year from various parts of the country asking for information as to the location of available respirators. The National Foundation for Infantile Paralysis on July 1, 1941 published a complete list of respirators, giving locations and owners, which may be obtained from the foundation at 120 Broadway, New York City.

It has long been recognized that the need for respirators arises in time of great emergency and that commercial respirators are not always available when needed. Furthermore, a simple respirator such as this should prove useful for intermittent home use to a limited number of badly paralyzed patients who have been hospitalized for many months. Since the respirator can be built cheaply,

* Reprinted with permission J. A. M. A. 118:535 (Feb. 14) 1942.

it can meet an economic problem heretofore almost unsurmountable for patients who require prolonged assistance of a respirator.

Mr. M. K. Reynolds has given to the Council on Physical Therapy a complete set of drawings with instructions for building this simple workable respirator. A pamphlet which graphically sets forth its construction has been prepared and is available for distribution on application to the Council on Physical Therapy of the American Medical Association. This pamphlet should enable any community far removed from a supply of commercial respirators to build this life saving device.

The Council on Physical Therapy has reviewed the plans for making this simple wooden respirator and has authorized the publication of this pamphlet.* We feel that Mr. Reynold's gift to humanity merits the gratitude of the entire profession.

PHYSICAL AGENTS IN TISSUE REPAIR

LEO NUTINI, M.D.

Institutum Divi Thomae

CINCINNATI, OHIO

The beneficial effects of physical agents, such as ultraviolet light and roentgen rays, in tissue repair have long been a matter of much controversy. The conflict has existed chiefly because of lack of sufficient direct experimental proof of the efficacy of these agents. The lack of understanding of the mechanism of their action on cellular activity has been a contributing factor. Recent work has done much to clarify this point, with the result that a definite role can now be assigned to such agents in the repair process. It has been shown that certain physical agents (ultraviolet light, roentgen rays and mechanical injury) when acting on living cells or tissues force them to liberate substances capable of stimulating metabolism — substances which may be considered a most important "formative stimulus"[1] to repair.

In the present paper is presented some of the experimental evidence for the existence of factors stimulating cellular metabolism. Experiments correlating the production of these factors with tissue injury are also described. An attempt has been made to indicate the simplicity with which these substances can be secured and their possible clinical value in wound repair. Such a discussion necessarily involves a knowledge of the "wound hormone" concept of wound healing and, while it is not the purpose of this paper to present an exhaustive review of the subject, some preliminary remarks appear to be in order.

Tissue repair is such a commonplace occurrence that one seldom stops to consider the nature of the mechanism behind this vital process or why it is that a cell which has remained quiescent for years should suddenly begin to multiply after an injury. The old tissue tension theory of Ribbert assumed that cells normally exert a restraining influence on one another but when injured lose this power and, as a result, permit multiplication of the surrounding cells. However, in the light of present knowledge it seems much more likely that the cellular proliferation which accompanies injury is a response to a stimulus, either direct or indirect, supplied by the injury.

* The cost of the pamphlet is ten cents.

This, the so-called "hormone concept of wound healing," is by no means a new theory, for its origin can be traced as far back as 1858, when Virchow[2] suggested that healing was a result of the direct stimulation of the cells by traumatism. It was not until 1892, however, that Wiesner[3] suggested his theory that the traumatic effect is an indirect one, the injured cells releasing substances (wound hormones) which stimulate the normal cells to proliferate, and it was not until 1922 and 1924 that the first preliminary information concerning the actual existence of growth-stimulating substances was presented by Naswitis.[4]

Since the work of Naswitis, the field has been extensively investigated in an effort to secure the stimulating factor or factors, and the "necrohormones" of Lorin-Epstein[5] and Frankel,[6] the "trephones" of Carrel[7] and the "SH radical" of Hammett[8] have at one time or another assumed leading roles, not to mention numerous other factors, including polypeptides,[9] glutathione and hemoglobin.[10]

With these observations as a basis, many of the supposed active factors were tried on experimental and clinical wounds, with a reported lessening of healing time in some of the cases. Whether these factors themselves act directly to stimulate wound healing or whether they act indirectly as "injuring agents" to cause the cells to liberate wound hormones is not clear. In spite of the vast amount of work that had been done on the subject of wound repair, the crucial experiment proving that substances (wound hormones) are generated by the cell as a result of injury to the cell rather than merely produced as disintegration products remained to be conducted.

Experiments

Ultraviolet Light. — Such was the status of the problem when the early research on the action of ultraviolet light in wound healing was being investigated. It has long been felt not only that the role ultraviolet light plays in this process is a germicidal one (a role clearly proved by the practical experiments of Wells and others[11a, b]) but that it actually accelerates healing, thus minimizing or preventing infection by its direct action on the tissues.[12]

The problem of acceleration, or stimulation, of growth by ultraviolet light has been the subject of controversy for years, some investigators repeatedly observing stimulation, others repeatedly reporting contradictory evidence. There existed contradictory evidence not only on the action of ultraviolet light in wound healing but on the stimulation of the growth of micro-organisms by ultraviolet light.

In the early researches in our laboratories,[13a, b, c, d, e, f] conducted chiefly on micro-organisms, the cause of these discrepancies, occurring under apparently similar conditions, was investigated and modifications in technic were developed which led to consistently uniform results and to the proof that ultraviolet light can stimulate the proliferation of cells.

Sperti and others[14] demonstrated that the action of ultraviolet light on cells is twofold: (1) the prevention of proliferation as the result of destruction of cells and (2) the stimulation of proliferation of the remaining living cells by factors produced by neighboring injured or dying cells. As a further result of the investigations they were able to isolate from the suspending medium proliferation-promoting substances elaborated by the injured cells which stimulated the proliferation of other cells, thus demonstrating conclusively that one of the actions of ultraviolet light on cells is to force them to release substances which stimulate the growth of their neighboring cells. These investigations show that not only does a cell produce substances which stimulate the growth of other cells but that factors stimulating respiration and glycolysis are likewise secreted.[13a, b, c, d, e]

After having extensively investigated the production of growth factors from injured micro-organisms, Loofbourow and others[15a, b] investigated the production

of similar factors from injured animal tissues. In these researches three types of tissue were used as sources of the growth-promoting factor: adult newts, 7 day chick embryos and 14 day rat embryos. In these experiments the radiations from a 500 watt quartz mercury arc lamp were used as the injuring agent. Irradiation was carried out in quartz test tubes, with constant stirring. The embryos were removed under sterile conditions, minced in Drew's solution or 0.89 per cent sodium chloride solution, and washed three or more times in changes of the solution to remove growth factors arising from mechanical injury. Each experimental sample was accompanied by a control sample, the control and the irradiated tissues being maintained under similar conditions (temperatures, etc.) except for the actual irradiation. Loofbourow and his coworkers concluded from these experiments that tests of the proliferation-promoting effects on yeast of intercellular wound hormones produced by the injury of the newt, chick and rat tissue with ultraviolet irradiation showed that these factors are active on yeast and can be assayed by quantitative yeast growth methods. They also concluded that their data indicated that growth factors produced as a result of mechanical injury (a subject which is discussed at greater length in this article) must be taken into account in evaluating the effects of ultraviolet radiations used in the experiments.

Fardon and Sullivan[16a, b, c] showed that tissue cultures can be used in some instances as a means of measuring the potency of proliferation-promoting factors, but it is apparent from their work that the tissue culture method has decided limitations in view of the fact that there is no way of abolishing the growth factors which arise through mechanical injury in the preparation of the cultures themselves. Loofbourow, Cueto and Lane discovered that greater growth and lesser degeneration occurred in cardiac explants grown in fluids from tissue injured by ultraviolet light than in controls grown in fluids from normal tissue. They concluded that animal tissues respond to injury by the production of intercellular wound hormones which, it is reasonable to assume, are the natural stimuli to the repair process in the tissues following injury. Carrel, Hammett and others, as previously stated, have suggested the possible importance of such materials in wound healing, but, by the process worked out in the Institutum laboratories, it has been possible for the first time to produce such active factors at will by controlled tissue injury, to relate their production definitely to injury of the cells and to obtain them in sufficiently large quantities to permit extended investigations of their chemical nature and physiologic effects.

Roentgen Rays. — Although the preceding experiments illustrate the value of ultraviolet light in tissue repair, experimental data on the relation of roentgen rays to this vital process are not nearly so complete or conclusive. However, evidence does exist which indicates that changes occur in the metabolism of tissues, particularly as regards their respiration. Fardon and others,[17] conducting experiments along these lines, showed that rat skin responds to exposure to roentgen rays by a short initial period of depressed respiration followed by a prolonged period of stimulation. Preliminary experiments[18] on tissue culture growth appeared to be accompanied by similar results, i. e., a period of depressed growth followed by a period of stimulation. While these experiments do not indicate a direct action of roentgen rays in tissue repair, they do indicate an indirect one, in that the metabolism of the tissue exposed to roentgen rays is stimulated.*

Today roentgen rays are being used with good results in the treatment of numerous types of lesions, including furuncles and carbuncles.[19, 20, 21, 22] Their value in the treatment of such conditions cannot possibly be attributed to their

* The significance of this increased metabolism in the wound healing process is discussed to some extent by Cook and Fardon.[1]

direct germicidal powers, since it has been proved by in vitro experiments that a much higher dose and a longer exposure are required for actual killing of micro-organisms than those used clinically. It would seem that when acting on pathologic tissues, roentgen rays possess, in addition to a direct action on the organisms involved, an action on the tissues themselves, perhaps forcing them to liberate either metabolic-stimulating substances similar to those previously described or substances which are toxic for the organisms.[23, 24] Whatever is the nature of this synergistic action, it is significant in the healing process.

Mechanical Injury. — Notable among the experiments on injuries produced by mechanical means are those of Carrel.[25] This investigator showed that if a simple incision produced by a sharp instrument was kept completely free from debris of tissue and blood clots and absolutely protected from outside irritation, healing would not take place. From this observation he advanced the theory that irritation set off the trigger mechanism for repair by bringing about invasion

Fig. 1. — May 14, 1938. Deep 2nd to superficial 3rd degree burn involving the entire circumference of the lower leg.

Fig. 2. — May 28, 1938. Applications of ointment containing metabolic-stimulating factors have resulted in rapid healing, as evidenced by marked epithelial proliferation, both centrally and peripherally. The numerous, small central islands of epithelium resemble pinch grafts.

of leukocytes which, in secreting "trephones," induced cicatrization. In early experiments of Fardon and Loofbourow, as previously stated, the existence of growth-promoting substances arising as a result of mechanical injury to tissues was recognized. Extensive study into their nature[17] has shown them to be similar to the materials produced by the action of ultraviolet light and roentgen rays.

In working on the problem of mechanical injury in tissue culture growth it was found that much greater growth occurred in cultures grown under the influence of embryonic juice prepared by cutting the embryos into small bits with a pair of scissors than in juice prepared by grinding them with sand in a mortar.[26, 16c]

This phenomenon indicates that growth-promoting substances are liberated to a greater extent by injured cells than by those completely destroyed. In addi-

tion, it would seem that these substances are materials liberated by the cells rather than merely disintegration products.

Further work was conducted along these lines with sound used as the mechanical injuring agent. In these experiments[27] yeast cells in suspension were subjected to a vibration frequency of 50 cycles over a period of five hours. Berkefeld filtrates of the suspensions yielded growth-promoting substances one and one-half to two and one-half times as potent as controls on a volume basis and one and one-half to four times as active on the basis of equal weights of solid in the filtrates.

Clinical Application. — From the previous experiments it is evident that cells react to injury, regardless of the type, by the production of metabolism-stimulating factors. It is likewise evident that the discovery of these factors,

Fig. 3. — June 18, 1938. Complete healing has resulted after 5 weeks' treatment. Minimal scarring and no contractures. Hair follicles and glands are present in the healed area.

factors which we consider the "formative stimulus or stimuli" to tissue repair, has opened the possibility of many practical applications in the field of medicine.

Investigations employing these agents in the treatment of wounds, both in laboratory animals and in human beings over a period of several years have had gratifying results. In animal experiments these results were manifested by a decrease in the time required for healing, absence of sepsis and freedom from scarring. In addition to these remarkable features, a minimum of pain was experienced by the human subjects. For the work on the treatment of human wounds we are indebted largely to Dr. Thomas F. P. Walsh,[28] of Mercy Hospital, Chicago, whose results are based on extensive treatment of burns during the past three years. With his permission we present photographs of a typical burn treated with an ointment containing metabolic-stimulating factors. The results speak for themselves.

From the foregoing, it is evident that many possibilities are open for investigation with these metabolism-stimulating materials. Moreover, their method of

production through the action of physical agents on the tissues seems certainly to justify the use of such agents in the repair process.

In view of the evidence demonstrating that the proper use of physical agents can result in the production of metabolism-stimulating factors, it may be seen that there are many possibilities for wider and more effective use of physical therapy in the treatment of wounds, in the treatment of disease and in hitherto unexplored fields.

References

1. Cook, E. S., and Fardon, J. C.: The Wound Hormone Concept in Wound Healing, Laboratories of the Institutum Divi Thomae. Accepted for publication by Surg. Gynec. Obstet.

2. Virchow, R.: Reizung und Reizbarkeit, Arch. path. Anat. **14**:1 (July) 1858.

3. Wiesner, J.: Die Elementarstructur und das Wachsthum der lebenden Substanz, Vienna, 1892.

4. Naswitis, K.: Über Auslösung von Zellvermehrungen durch Wundhormone bei höheren Säugetieren und dem Menschen, Deutsch. med. Wchnschr. **48**:187 (Feb.) 1922.

5. Loren-Epstein, M. J.: Über einige allgemeine Faktoren der Wiederherstellungsprozesse und ihre Bedeutung für die chirurgische Pathologie, Arch. klin. Chir. **144**:632 (Nov.) 1926.

6. Frankel, P.: Versuche über Wechselbeziehungen zwischen doppelseitigen Knochenbrüchen, Arch. klin. Chir. **150**:170 (Feb.) 1928; Grundeigenschaften der allgemeinen Regenerationshormone, *ibid.* **154**:398 (Oct.) 1928; Hauptwirkungen der allgemeinen Regenerationshormone, *ibid.* **155**:215 (Feb.) 1929; Die Eigenhemmung des Differenzierungshormone, *ibid.* **156**:315 (Aug.) 1929; Über die "Regel des anderen Weges" bei der Wirkung von Abbaustoffen auf die Regeneration, *ibid.* **168**:524 (Aug.) 1931; Die ursächlichen und die regulierenden Wirkungen der Abbaustoffe auf die Regeneration, *ibid.* 169:477 (Dec.) 1931.

7. Carrel, A.: Leukocytic Trephones, J. A. M. A. **82**:255 (Jan. 26) 1924.

8. Hammett, S. F.: The Chemical Stimulus Essential for Growth by Increase in Cell Number, Proc. Am. Phil. Soc. **60**:151, 1929; Protoplasma **7**:297, 1929.

9. Carrel, A., and Baker, L. E.: The Chemical Nature of Substances Required for Cell Multiplication, J. Exper. Med. **44**:503 (Oct.) 1926.

10. Baker, L. E.: The Chemical Nature of the Substances Required for Cell Multiplication, J. Exper. Med. **49**:163 (Feb.) 1929.

11a. Wells, W. F.: Air-Borne Infection, Mod. Hosp. **51**:66 (July) 1938.

b. Wells, W. F.; Wells, M. W., and Mudd, S.: Infection of Air-Epidemiologic and Bacteriologic Factors, Am. J. Pub. Health **29**:863 (Aug.) 1939.

12. Nutini, L. G.: The Growth-Promoting Role of Ultraviolet in Wound Healing, Laboratories of the Institutum Divi Thomae. In publication.

13a. Fardon, J. C.; Norris, R. J.; Loofbourow, J. R., and Ruddy, M. V.: Stimulating Materials Obtained from Injured and Killed Cells, Nature **139**:589 (April 3) 1937.

b. Fardon, J. C.; Carroll, M. J., and Ruddy, M. V.: The Stimulation of Yeast Respiration by Radiations, Studies Inst. Divi Thomae **1**:17 (June) 1937.

c. Fardon, J. C., and Ruddy, M. V.: A Respiratory-Stimulating Factor, *ibid.* **1**:41 (June) 1937.

d. Norris, R. J., and Ruddy, M. V.: A Study of Stimulation of Growth, Respiration and Fermentation by Bios and Bios-like Substances, *ibid.* **1**:53 (June) 1937.

e. Sperti, G. S.; Loofbourow, J. R., and Dwyer, C. M.: Proliferation-Promoting Substances from Cells Injured by Ultraviolet Radiation, Nature **140**:643 (Oct. 9) 1937.

f. Norris, R. J., and Kreke, C. W.: Three Metabolic Stimulating Factors, Studies Inst. Divi Thomae **1**:137 (Nov.) 1937.

14. Sperti, G. S.; Loofbourow, J. R., and Dwyer, C. M.: Proliferation-Promoting Factors from Ultraviolet Injured Cells, Studies Inst. Divi Thomae **1**:163 (Nov.) 1937.

15a. Loofbourow, J. R.; Cueto, A. A., and Lane, M. M.: Stimulation of Tissue Culture Growth by Intercellular Wound Hormones from Injured Tissues, Arch. f. exper. Zellforsch. **22**:607 (Oct.) 1939.

b. Loofbourow, J. R.; Dwyer, C. M., and Lane, M. M.: Proliferation-Promoting Intercellular Hormones. I. Quantitative Studies of Factors Produced by Injured Animal Tissue Cells, Biochem. J. **34**:432 (Mar.) 1940.

16a. Fardon, J. C., and Sullivan, W.: Growth-Promoting Substances from Injured Tissue in Vitro, Studies Inst. Divi Thomae **2**:39 (Nov.) 1938.

b. Fardon, J. C., and Sullivan, W.: The Effect of a Steam Distillate on the Growth of Embryonic Tissue in Vitro, *ibid.* 2:51 (Nov.) 1938.

c. Fardon, J. C.; Sullivan, W., and Andrus, M. B.: Growth-Promoting Substances Liberated by Traumatized Tissue in Vitro, *ibid.* **2**:233 (Nov.) 1939.

17. Fardon, J. C; Sullivan, W. A.; Brotzge, G. C.; Loeffler, M. K., and Andrus, M. B.: Changes in Respiration Following Irradiation with X-Rays, Studies Inst. Divi Thomae **2**:203 (Nov.) 1939.

18. Fardon, J. C.: Laboratories of the Institutum Divi Thomae. Unpublished work.

19. Coyle, R. R.: Odds and Ends of X-Ray Work Including Some Cases of Carbuncle, Med. Electrol. Radiol. **7**:139, 1906.

20. Berndt, F.: Zur Behandlung von Gesichtsfurunkeln und Nackenkarbunkeln, Zentralbl. f. Chir. **51**:2686 (Dec.) 1924.

21. Hodges, F. M.: The Roentgen Ray in the Treatment of Carbuncles and Other Infections, Am. J. Roentgenol. **11**:442 (Jan.) 1924; Roentgen Ray in Treatment of Local Inflammations, Cellulitis and Carbuncles, J. A. M. A. **85**:1292 (Oct.) 1925; Roentgen Ray in Treatment of Certain Localized Infections, Southern M. J. **19**:857 (Dec.) 1926.

22. Light, R. V., and Sosman, M. C.: The Treatment of Carbuncles by the Roentgen Ray, New England J. Med. **203**:549 (Sept.) 1930.

23. Schroeder, M. P., and Hollencamp, C. H.: Growth Factors for Bacteria, Laboratories of the Institutum Divi Thomae. In publication.

24. Nutini, L. G., and Kreke, C. W.: The Toxic Effect of Spleen Extract on Hemolytic Streptococci, Laboratories of the Institutum Divi Thomae. In publication.

25. Carrel, A.: Factors Initiating Regeneration, J. Exper. Med. **34**:425 (Mar.) 1921.

26. Fischer, A.: Tissue Culture, Levin and Munksgaards, Copenhagen, 1917, p. 84; Virchow's Arch. path. Anat. **279**:94, 1930.

27. Loofbourow, J. R.; Cook, E. S.; Dwyer, C. M., and Hart, M. J.: Production of Intercellular Hormones by Mechanical Injury, Nature **144**:553 (Sept. 23) 1939.

28. Walsh, Thos., F. P., Mercy Hospital, Chicago. In publication.

TECHNICIANS EXAMINATIONS

Examinations for registration of qualified technicians are being arranged as follows: May 26, 1942, in Boston. Richmond, Va., Buffalo, N. Y., and Detroit, Mich.; June 1, St. Louis, Mo., and Stanford, Calif.; June 2, Boston; June 10, Minneapolis, Minn.; June 14, Rochester, Minn.; June 22, New York, N. Y.

For further information write American Registry of Physical Therapy Technicians, 30 North Michigan Avenue, Chicago, Illinois.

SCHOOLS APPROVED FOR TRAINING PHYSICAL THERAPY TECHNICIANS *

By the Council on Medical Education and Hospitals

Name and Location of School	Medical Director	Technical Director	Entrance Requirements *	Duration: Regular Course	Duration: Emergency Course	Time of Admission: Regular Course	Time of Admission: Emergency Course	Tuition**	Certificate / Diploma / Degree **
Children's Hospital, Los Angeles	Steele F. Stewart, M.D.	Miss Lily H. Graham	(a) R. N. (b) Phys. educ. major (c) 2 yrs. coll.	12 mos.	6 mos.[1]	Feb. and Sept.	Feb. and Sept.	$200 R $200 E	Diploma R Certificate E
Stanford University, Stanford University, Calif.	William H. Northway, M.D.	Miss Catherine Worthingham, A.B., M.A.	(a) R. N. (b) Phys. educ. major (c) 3 yrs. coll.	12 mos.[1]	7 mos.[1]	Jan. and June	Jan. and June	$429 R $286 E	Certificate or B. A.
Walter Reed General Hospital, Washington, D. C.	B. A. Strickland, Jr., Capt., M.C.	Miss Emma E. Vogel	Phys. educ. major	.....	6 mos.	.....	Quarterly	None	Certificate
Northwestern University Medical School, Chicago	John S. Coulter, M.D.	Miss Gertrude Beard, R.N.	(a) R. N. (b) Phys. educ. major (c) 3 yrs. coll.	9 mos.[3]	6 mos.[3]	Oct.	Jan. and July	$200 R $200 E	Certificate
Bouvé-Boston School of Physical Education, Boston	Arthur L. Watkins, M.D.	Miss Constance K. Greene	High sch. grad.	3 yrs. 4 yrs.[2]	.....	Sept.	.....	$400 yr.	Diploma or B. S.
Harvard Medical School, Boston	Frank R. Ober, M.D.	Miss Janet B. Merrill	(a) R. N. (b) Phys. educ. major (c) 2 yrs. coll.[3]	9 mos.	6 mos.[3]	Sept. and March	Sept. and March	$200 R $200 E	Certificate
Boston University, Sargent College of Physical Education, Cambridge, Mass.	Louis Howard, M.D.	Mrs. Lucille W. Fuller	2 yrs. coll.	2 yrs.	[4]	Oct.	[4]	$547	Certificate and B. S.
Posse Institute, Kendal Green, Mass.		Miss Lucy G. Marshall	High sch. grad.	3 yrs.[1]	.....	Sept.	.....	$415 yr.	Diploma
University of Minnesota, Minneapolis	M. E. Knapp, M.D.	Miss Sara E. Kollman, R.N.	(a) R. N. (b) Phys. educ. major (c) Medical technology grad. with B.S. degree	12 mos.[1]	.....	June and Sept.	.....	Univ. fees	Certificate
Mayo Clinic, Rochester, Minn.	Frank H. Krusen, M.D.	Mr. Carl O. Moe, R.N.	(a) R. N. (b) Phys. educ. major (c) 2 yrs. coll.	.....	6 mos.[1]	.....	Jan. and July	None	Certificate
St. Louis University School of Nursing, St. Louis	Alexander J. Kotkis, M.D.	Sister M. Consella, R.N.	High sch. grad.	4 yrs.[1]	.....	Jan. and Sept.	.....	$250 yr.	B. S.
University of Buffalo school of Nursing, Buffalo	George G. Martin, M.D.	Miss Edna Beaver, R.N.	(a) R. N. (b) Phys. educ. major (c) 2 yrs. coll.	12 mos.[1]	6 mos.[1]	Feb. and Sept.	Feb. and Sept.	$425 R $375 E	Certificate
Hospital for Special Surgery, New York City	Kristian G. Hansson, M.D.	Miss Ethel M. Willmer	(a) R. N. (b) Phys. educ. major (c) 2 yrs. coll.	9 mos.[1]	6 mos.[1]	Sept.	Sept.	$300 R $200 E	Diploma
D. T. Watson School of Physiotherapy, Leetsdale, Pa.	Jessie Wright, M.D.	Miss Dorothy Loydahl	(a) R. N. (b) Phys. educ. major (c) 2 yrs. coll.[5]	2 yrs.[1]	6 mos.[1]	Sept.	Jan. and July	None R $200 E	Diploma R Certificate E
Richmond Professional Institute of the College of William and Mary, Richmond, Va.	Thomas W. Wheeldon, M.D.	Miss Alice Jones	(a) R. N. (b) Phys. educ. major (c) Coll. grad. (d) High sch. grad.	9 mos. 4 yrs.	.....	Feb. and Sept.	.....	Coll. Fees	Certificate or B. S.
University of Wisconsin Medical School, Madison	Ernst A. Pohle, M.D.	Miss Margaret Kohli, B.S.	(a) R. N. (b) Phys. educ. major	12 mos.[1]	.....	Feb. and Sept.	.....	Univ. fees	Certificate

* Courses are so arranged that any of the entrance requirements (a, b, c or d) will qualify students for training.

** R = Regular course; E = Emergency course.

1. Male students are admitted.
2. Four year course leads to B.S. degree from Simmons College.
3. This group admitted to emergency course only.
4. Emergency course offered in cooperation with Harvard Medical School.
5. Only those with three years of college are admitted to emergency course.

* Reprinted with permission, J. A. M. A. **118**:1137 (March 28) 1942.

ARCHIVES of PHYSICAL THERAPY

OFFICIAL PUBLICATION AMERICAN CONGRESS OF PHYSICAL THERAPY

.·. EDITORIALS .·.

PHYSICAL THERAPY IN REHABILITATION

The value of physical therapy following injuries has been repeatedly stressed by medical men. Mr. Kuechle, Vice-President and Claim Manager of the Employers Mutual Liability Insurance Company of Wisconsin, points out in an article in this issue the economical value from the viewpoint of the insurance company and the employer of properly prescribed and administered physical therapy. So thoroughly convinced is his company of the value of physical therapy that the company established a department for the treatment of injuries. His condemnation of the practice of referring a patient to a technician with the prescription of "some physical therapy," which procedure he likens to referring a patient to a pharmacist with the request that he be given "some medicine," is one in which all conscientious physicians will concur. Physical procedures are capable of producing definite effects, and if improperly administered or prescribed, are capable of producing great harm. Fortunately, the subject of physical therapy is receiving more attention than ever in medical schools. In many medical schools undergraduate instruction is required. Many training centers for technicians under proper auspices have also been established. Postgraduate courses for physicians desiring to train themselves for directing the departments of civilian and military hospitals are now available. Northwestern University Medical School has instituted a three months' intensive course in physical therapy for physicians of the nations of the Western hemisphere who desire training in the use of physical therapy in combating the after-effects of injuries sustained in civilian and military life. It was during World War I that the most rapid progress was made in the application of physical therapy to rehabilitation; in this war for democracy, with the probabilities of greater casualties, still greater stimulus to its use will be imparted. We should be determined that those disabled, whether in the fighting services, the home defense, or industry shall not be human derelicts, that these men and women shall not be condemned to a lifetime of drudgery or charity through some disability which early and effective physical therapy might have prevented. Adequate intensive courses will provide the basis for the effective employment of physical therapy. With a greater number of physicians entering the armed services greater responsibilities than ever rest on the shoulders of the none too many physicians in civilian practice. Facilities of both an educational and physical nature in the field of physical therapy should be further extended in order that the important contribution which civilian as well as practitioners and hospitals may make to the maintenance of a high level of health and vigor in the populace and in the combat forces be not retarded.

Physicians knowing the physiologic effects of the various physical energies and procedures will prescribe more intelligently the various agents and procedures, making such modifications in technic as the pathologic condition which is present and the result to be obtained suggest for each patient. Properly trained technicians will be equipped to carry out such prescriptions. The result will be a more effective use of physical therapy.

Today we are engaged in total war — a war in which industry plays as important a part as the military forces. The rehabilitation of those injured in in-

dustry is of as much importance as the early rehabilitation of military casualties.

Early and effective physical therapy will shorten the period of disability and decrease the degree of final disability. Man-hours can be conserved and production maintained at a high level. Now is the time to prepare to care for the disabled in order to return them as soon as possible to industry and to the military forces, fully rehabilitated to "carry on."

CANCER AND ULTRAVIOLET LIGHT

During the past twenty years two lines of work have chiefly engaged the attention of those interested in experimental cancer research. On the one hand the production of cancer by means of pure chemicals has shown that neoplasms may be produced by substances closely related to and in some cases identical with compounds formed by the bodily metabolism. On the other hand certain viruses have been found to be closely related to the genesis of malignant tumors. Less attention has been given to physical means of producing cancer, although in addition to radium and roentgen rays it is now known that ultraviolet light is carcinogenic. Ever since Unna described, under the name of *Seemanshaut*, certain precancerous changes in the skin of sailors, it has been realized that wherever, as in Australia, the southern United States or the Argentine, people of European extraction live in a semitropical environment an excessive amount of cancer of the skin of the face and hands results. The incidence in such countries is always greatest among farmers and others who are most exposed to the weather, while the minimum time of exposure necessary to ensure the development of cancer is in the neighborhood of fifteen years.

Nothing was known of the exact cause of this high susceptibility to skin cancer except that it was due to exposure to wind and weather. In 1928, however, Findlay showed that exposure of mice to a mercury-vapor lamp was capable of producing cancer on the back and ears of mice, the effects not being due to the heat but to the light emitted by the lamp. Subsequently Findlay produced skin papillomata in the rat, the time necessary for the appearance of the tumors being longer than in the mice. These results were confirmed both in rats and mice. Later Huldschinsky produced sarcoma in the corneas of rats by prolonged exposure to ultraviolet light, while Roffo found that exposure of rats to direct sunlight also caused carcinoma and sarcomata. These results were also confirmed. More recent experiments have revealed the part of the spectrum which is actively carcinogenic. Roffo concluded that the active portion lay between 2900 and 3500 angstrom units, although his experiments did not exclude wavelengths below 2900 angstrom units. More definite results have been obtained by Rusch, Kline and Baumann, who found that carcinogenic action lay in the wavelengths between 2900 and 3341 angstrom units; wavelengths of 2537 and 3341 angstrom units and above were noncarconogenic.

These results are interesting in view of the theories which Roffo has put forward in a long series of papers. He believes that when skin is exposed to light the cholesterol content of the skin is increased and that cholesterol, or some derivative of it induced by exposure to ultraviolet light, is responsible for the production of carcinomata. So far as the increased cholesterol content of skin exposed to ultraviolet light is concerned, experiments show that it is true of the rat but not of the mouse or guinea pig. In view of the known carcinogenic action of certain sterols further work is required to determine whether carcinogenic substances are produced by the action of ultraviolet light on naturally occurring sterols. Certain other experimental lines of investigation are also suggested by the cancer-producing action of ultraviolet light. Ultraviolet light, together with roentgen rays and radium, both of which are carcinogenic, is one of the most commonly used methods of inducing mutations in the chromosomes of the germ cells. Recently Mackenzie and Muller have shown that the wavelengths producing such mutations in drosophila lie between 3000 and 3200 angstrom units and do not appear to injure the chromosomes. Does ultraviolet light function in a similar manner in inducing skin cancer or is it necessary to confine the term mutation to hereditary changes confined to the chromosomes? In viruses such as those of tobacco mosaic, yellow fever and the rabbit fibroma hereditary variations in every way analogous to true mutations have been described, although at the level of organization of the viruses chromosomes are unknown. In the case of the tobacco mosaic virus, Stanley has shown that different strains of the virus protein differ in their chemical properties, while Knight and Stanley have recently obtained definite

information concerning some of the structural differences that exist between variant strains of the tobacco mosaic virus. It is therefore not too much to hope that before long it will be possible to produce a true mutation by chemical manipulation of the tobacco mosaic molecule. Finally, ultraviolet light cancer suggests a third possibility. Is the action of ultraviolet light on the skin merely one of bringing to light and localizing an "indigenous" virus? Lambeau, for instance, has shown that a latent zoster virus may be activated and localized by treatment with ultravioelt light. Suggestive evidence of an "indigenous" cancer virus has lately been brought forward by Bittner who has found that a "factor" present in spontaneous mouse cancer, as well as in mouse spleen and milk, can be frozen and dried. When fed to mice of a low cancer-producing strain the incidence of mammary cancer is greatly reduced. There is much to be done, as a modern poet has said, in "the gradual exploring of all the octaves of radiation." — [Edit. The Lancet **2**:193 (Aug. 16) 1941.]

MEDICAL NEWS

News From Our Dr. Solomon

A letter from the Antipodes by our good friend and member of the Editorial Board, Dr. Walter M. Solomon, dated April 5, states:

"The unit I'm associated with has not begun their real hospital work as yet because of many delays but have hopes of getting started soon. The physical therapy department consists of a few rooms, six infra-red lamps, four enlisted men assigned to the department, two of these men are young chiropodists and two have had a few weeks' work in a camp physical therapy department, and myself. We may lack equipment and personnel but we have a lot of enthusiasm, ambition and a certain naive confidence that we can get the job done. Will write you more of this later."

We wish Dr. Solomon continued cheer and success in all of the work to which he is so intensely devoted.

New Course for Physical Therapy Technicians at Barnes Hospital

Barnes Hospital in conjunction with Washington University School of Medicine, St. Louis, Missouri, opened its first training school for physical therapy technicians on February 2, 1942, with an enrollment of seven. It is planned to start the next session on October 5, 1942. Dr. Frank H. Ewerhardt is Medical Director of the course.

Council Approval for Physical Therapy Courses

The Council on Medical Education and Hospitals has extended its approval for the following regular courses for physical therapy technicians:

University of Minnesota, Minneapolis, Minn., twelve months course; M. E. Knapp, M.D., Medical Director and Miss Sara E. Kollman, R. N., Technical Director;

New York University, New York, N. Y., nine months' course; William Bierman, M.D., Clinical Director and George Deaver, M.D., Curriculum Director;

For the duration of the emergency the Council has extended its approval for the following emergency courses for physical therapy technicians:

Bouvé-Boston School of Physical Education, Boston, six months' course; Arthur L. Watkins, M.D., Medical Director and Miss Constance K. Greene, Technical Director;

University of Wisconsin, Madison, six months' course; Ernst A. Pohle, M.D., Medical Director and Miss Margaret Kohli, B.S., Technical Director.

The Spring Session — Eastern Section April 11, 1942 Jefferson Hospital, Philadelphia, Pa.

On invitation from the Pennsylvania Academy of Physical Medicine, Fellows of the American Congress and their guests gathered in the Jefferson Hospital Amphitheatre, Saturday, April 11, at 2 p. m., to hold the Spring Session of the Eastern Section of the Congress. At 1:30 p. m., there was a tour through the Department of Physical Medicine, conducted by the Director, Dr. William Schmidt, who was the local chairman and under whose guidance, the program moved smoothly.

The audience was interested and attentive to judge from the discussion, questions asked and notes taken and the complete absence of whispering, visiting around and loud discussion of personal experience, that frequently mar meetings when the chap who should have stayed home and talked to himself or gone out and hired a hall, in a loud voice proclaims his "priorities" or superior (?) knowledge to a non-listening world.

Some essayists have not yet learned the dicta of the American Medical Association on twenty minutes for presentation of papers and five minutes for discussion and that longer time is al-

lowed only by special dispensation if the knowledge be such as to warrant it. These must not complain if chairmen refrain from calling on them more frequently. "Art is long and time is fleeting" and if a discussor insists on encroaching on eternity he must pay the penalty.

With few exceptions the chosen discussors kept well within bounds and to the point, added much to the program and we will be looking forward to hearing from them in the future. They brought out points that were well taken, provided food for thought and opened up new prospects for contemplation.

At the close of the afternoon session, Dr. Schmidt showed 6 patients from his clinic, demonstrating methods used and disclosing excellent results. Certainly, there was no time lost in his presentation and by 6:25 p. m., the audience was ready to partake of the dinner scheduled for 6:30 p. m.

The evening session was somewhat delayed since many visitors wished to exchange compliments and discuss moot points and as trains from the City of Brotherly Love go to bed the same time as the good burghers, many had to leave early. Illness claimed several discussors but their substitutes helped greatly to make up for their enforced absence and we hope we may greet them in the near future.

In the view of those who stayed to the last, it was well worth while, as the papers and discussions were outstanding and epoch-making and should take their place with the new procedures accepted in forward-looking medicine of today. None who came to hear but took something with him well worth the journey, the effort and the time involved.

Many thanks are in order and are heartily bestowed as follows:

To the essayists for papers that are timely, interesting and provocative; to the discussors for restraint, brevity and pointedness; to the audience for attention, good manners and cooperation; to the Connecticut Physical Therapy Society, the New Jersey Society of Physical Therapy Physicians and the New York Physical Therapy Society for all their help; to the Pennsylvania Academy of Physical Medicine for choosing Philadelphia and to Dr. Schmidt and Jefferson to represent them; and, especially to the Secretary, Isador Levin of Washington, D. C., for his unceasing aid by letter, telegram, telephone, air mail and lively presence in the labor of making the Spring Session a success.

To those New Yorkers who took the 12:20 (delayed 20 minutes) train out of William Penn's Metropolis, it was voted a day well spent in the good cause that is in our consciousness most of our waking time and as we sought our various couches in the wee sma' hours we hoped we had planted new seed, helped the plants already flourishing and can look forward to many new workers in the vineyard.

MAIDE C. L. MCGUINNESS, *Chairman.*

Midwestern Section of Congress

The Midwestern Section of the American Congress of Physical Therapy held its annual spring session in the Medical Amphitheater of the State University of Iowa Hospital on Monday, April 6th, 1942, under the chairmanship of Dr W. D. Paul of Iowa City.

Dr. Max K. Newman of Detroit, opened the program. His topic was "Hypothermic Anesthesia in Extremity Surgery." Other features of the morning program were papers presented by Dr. Stuart Cullen, Iowa City, "The Rationale of Oxygen Therapy During Hyperpyrexia," and Adelaide P. Barer, Ph.D., "The Effect of Ultraviolet Irradiation on Hemoglobin Formation."

The morning session was followed by a tour of the hospitals. Luncheon was served in the doctor's dining room of the hospital. This was followed by the afternoon session at which Dr. John S. Coulter of Chicago, presented an interesting view of "Physical Therapy in Fractures," and "The Relation of Physical Therapy in War," was discussed by Dr. Frank H. Krusen of Rochester, Minnesota.

"The orthopedic treatment of poliomyelitis in the subacute and chronic stages has undergone changes in later years which represent a very definite departure from the conventional ideas and methods." So spoke Dr. Arthur Steindler of Iowa City in his presentation of "The Treatment of Acute and Subacute Poliomyelitis." He went on to state that the orthodox treatment teaches, above all things, that in order to insure the optimum return of muscle function in infantile paralysis the most essential factor is the continuous and uninterrupted rest, position of the limb in a contentive splint or plaster dressing which will prevent any changes of a position and that to take a limb out of a position of absolute immobilization during the subacute stage, even for a few moments, would mean a retardation of recovery possibly extending over many months. Now we are told that the passage of a muscle through its complete range of motion at frequent intervals would rather enhance than retard recovery by stimulating the venous circulation and lymphatic passages to the affected members which heretofore have been deprived of their normal pumping motion.

Dr. Steindler continued to give a report of observations made in the clinic relative to this theory, and in conclusion stated:

"We have had to make a decided departure from the old-time orthodoxy. At the same time it would be a mistake to fall into the other extreme and relinquish all methods and devices which the orthodox treatment instituted for the preservation of muscles, for the control of pain and the avoidance of fatigue. I believe when we are convinced as to the soundness of the newer clinical observations in infantile paralysis, the application of common sense and that of general biological principles will find for us the proper road to conduct, free of orthodoxy or narrow-mindedness on one side or another. If we have learned well our lesson to avoid the extreme or-

thodoxy of the past, it should equally serve us against radicalism of the future."

Physical Therapy in Australia

Now that the forces and fortunes of the United States and Australia are so closely intertwined, the following excerpt from a letter of Dr. Walter M. Solomon and the comments thereon will be of special interest:

"Physical therapy in Australia is at a rather low ebb which is somewhat surprising when one thinks of the influence of British medicine. Many of the large hospitals have no departments and the few that do have physical therapy sections are poorly equipped and staffed with an indifferent personnel. The medical supervision is nil except in those places where Dr. Frank May is in charge. There is much room for missionary work."

The name of Dr. Frank May of Melbourne is well known to the leaders of physical therapy. After carrying on special study in physical therapy with the late Dr. Cumberbatch in London, he visited in 1934 the main centers in the United States in company of his charming wife and made many friends. Upon his return to Australia he established an up-to-date physical therapy department at Epworth Hospital, Melbourne, and inaugurated the use of artificial fever treatment there. He has brought much respect to the cause of physical therapy and has become consultant of a number of hospitals and recently, director of a large army hospital near Melbourne. He has been an active member of the American Congress of Physical Therapy since his visit here.

Kenny Method Training Courses Set

The completion of final arrangements for courses in the Kenny method of the treatment of early poliomyelitis, has just been announced by Dr. Harold S. Diehl, Dean of the Medical Sciences of the University of Minnesota.

The courses which are being financed by the National Foundation, will be given in Minneapolis under the supervision of Dr. Miland E. Knapp, Director of the Department of Physical Therapy of the University. They have been arranged for physicians, registered physical therapy technicians, nurses with responsible positions in teaching institutions and nurses in key positions in large contagious hospitals. The classes will be repeated at various times in the next six to twelve months.

Facts About Courses

Details regarding the courses follow:

1. *The Physician's Course* is of one week duration and is intended to familiarize him with the principles of the treatment and enough of the technique so that he can supervise trained assistants. These courses are limited to fifteen physisians and will be repeated from time to time as the demand requires.

2. *The Course for Nurses* from contagious hospitals is also of one week duration and is intended to train the student only in the preparation and application of the Kenny Hot Foments.

3. *The Course for Registered Physical Therapy Technicians*, preferably technicians who have also had nurses' training, and for nurses in teaching institutions is of two to six months duration. At the end of two months and thereafter, proficiency examinations will be given. A certificate of proficiency will not be granted until the student has satisfactorily mastered the technique. This course will be limited to twenty-five students. It will start April 13, 1942. If openings are available, new students may be accepted on May 11, 1942 and June 15, 1942.

It is recommended that each institution which contemplates giving the Kenny treatment should send a physician, a technician and a nurse for training in the various phases of the work.

A limited number of tuition scholarships (not including meals and lodging) will be made available by the Foundation on application, as an additional contribution toward disseminating information about poliomyelitis.

Application for training and inquiries concerning fees and dates of scheduled courses should be sent to the Director, Center for Continuation Study, University of Minnesota, Minneapolis.

Virus Research Yields Valuable Facts

Commenting on scientific achivements in the field of infantile paralysis, Basil O'Connor stated recently:

"Like the defense plant that cannot turn out bombers or tanks until the machinery and tools have been produced with which to make these bombers and tanks, our laboratories, up to now, have been handicapped in their search for the prevention and cure for this disease, but now new tools have been forged with which to do the work and nothing must stand in the way of continued progress.

"We know something of how the virus spreads, although we cannot as yet actually *prevent* its spread. The study of the disease, at last, begins to resemble initial research in the conquest of other diseases, such as typhoid and yellow fever.

"Because of improved facilities, we can try out new treatments under laboratory conditions with proper 'controls.' We have learned to use rats and mice as experimental animals. These cost from 15c to 50c each compared with $15 and over for monkeys which, until recently, were the only animals to be used in this work.

"New techniques of isolating the virus from flies, human feces, etc., have been developed so that we can obtain a much higher percentage of reliable laboratory findings. Until last year, perhaps only 30 per cent of the specimens worked on in laboratories from which the virus should have been isolated achieved the result. Today, the percentage is as high as 90 per cent.

"The virus has now been introduced into susceptible experimental animals not only by cerebral and abdominal injection but also through

the alimentary canal and by inhalation. These means more nearly duplicate what might be the human method of contracting the malady.

"Daily, physicians are gaining more knowledge of the treatment phase. Invaluable information has been collected by our grantees and as rapidly as possible the Foundation has disseminated it to medical authorities all over the country, thus arming them with knowledge they personally could not obtain."

Medical Committees' Statements on Kenny Method

At the Second Annual Medical Meeting of the National Foundation for Infantile Paralysis, the Committee on Research for the Prevention and Treatment of After-Effects adopted the following statement relative to the present status of the Kenny method:

"It is the opinion of this Committee on Research for the Prevention and Treatment of After-Effects of the National Foundation for Infantile Paralysis, after a study of the report of the workers at the University of Minnesota, that during the early stage of infantile paralysis the length of time during which pain, tenderness and spasm are present is greatly reduced and contractures caused by muscle shortening during this period are prevented by the Kenny method. The general physical condition of the patients receiving this treatment seems to be better than that of patients treated by some of the other methods during a comparable period."

The Empire Rheumatism Council

The fifth annual report of the Empire Rheumatism Council states that, though the war has delayed, it has not thwarted its plans. The large measure of attention it has won for a long neglected problem of public health and, in particular, the good progress last year is reason for reassurance. The publication early this year of "Rheumatism—A Plan for National Action" brought a notable awakening of public interest in the serious lack of facilities for effective treatment of rheumatic disease. The task is still to be faced of persuading the community, working through the appropriate authorities, to take action. Several favorable facts in regard to the provision of effective means of treatment are to be recorded. The Carnegie Dumferline Trust has approved of action taken in that town, and a bequest has been received toward the cost of a hospital or clinic in Aberdeen. The treatment centers in the United Kingdom continue their work, and the demand on their services shows how much they are valued. But the position still remains that only a small portion of sufferers can obtain in the early stages the right diagnosis and the right treatment, which would save a great proportion from becoming disabled. — J. A. M. A. **118**:1508 (April 25) 1942.

The Georgia State Merit System Administration, State Department of Public Welfare, Child Welfare and Crippled Children Division Announces Competitive Examinations for Positions in the Above Department and Division

The Supervisor of Examinations of the Georgia State Welfare Department announces competitive examinations for filling positions in the Public Assistance, Crippled Children, and Child Welfare Divisions. In the Crippled Children Division the salary ranges are minimum $1,800, maximum $2,280 for the position of Medical Social Worker, Orthopedic Field Nurse and Physical Therapy Technician; for District Orthopedic Field Nurse a minimum of $1,920 and a maximum of $2,400; Physical Therapy Consultant a minimum of $2,400, a maximum of $2,800; Orthopedic Nursing Consultant and Medical Social Consultant begin at a minimum of $2,700 and arrange to a maximum of $3,180; Medical Director of the Crippled Children Services begin at a minimum of $4,200 and with a maximum of $5,400.

In the Child Welfare Group the positions of Child Welfare Consultant and Senior Child Welfare Worker a minimum of $1,800 and the maximum of $2,280; Senior Child Welfare Consultant and Child Welfare Psychologist minimum of $2,400, a maximum of $2,520; Senior Child Welfare Consultant Grade I a minimum of $2,400, a maximum $3,000, and Child Welfare Worker a minimum $1,440, a maximum of $1,920.

All of these positions are opened to competitive assembled examinations except the Medical Director of the Crippled Children Services which is an unassembled examination. The examinations are based upon a rating of training and experience; a written test, and an oral interview. Each eligible who is appointed from the adequate Register will be required to serve a probational period of six months as is the usual custom in Civil Service and Merit System Agencies.

Georgia State Residence is not required of an applicant in order to participate in the above examinations.

Arthritis Now Linked to Rheumatic Fever

Evidence that chronic infectious arthritis in adults may have resulted from rheumatic fever in childhood was given the American Association of Pathologists and Bacteriologists by Dr. Archie H. Baggenstoss and Dr. Edward F. Rosenberg of the Mayo Clinic.

The two Mayo physicians felt that arthritis involves more than disease of the joints; that it involves the vital organs, the crippled joints being merely one expression of the malady.

They examined the organs of 30 patients who had had chronic infectious arthritis and found evidence of disease in the heart, kidneys, liver and other organs. There was damage to the heart in 24 cases and in 16 of these the injury was indistinguishable from that caused by rheumatic fever. Also significant was the pathologic condition discovered in the kidneys. It was felt that heart and

kidney damage was due to the same underlying set of causes.

Drs. Baggenstoss and Rosenberg concluded there may be a relationship between chronic infectious arthritis and rheumatic fever, typically a disease of childhood.—*Science News Letter.*

Physical Therapy Technicians in All Hospitals, 1941

	Full Time	Part Time
Alabama	20	3
Arizona	9	4
Arkansas	19	4
California	233	39
Colorado	37	8
Connecticut	46	9
Delaware	8	....
Dist. of Columbia	50	1
Florida	27	14
Georgia	46	8
Idaho	5	1
Illinois	154	19
Indiana	36	15
Iowa	38	10
Kansas	33	19
Kentucky	26	4
Louisiana	31	4
Maine	17	3
Maryland	43	8
Massachusetts	102	30
Michigan	118	15
Minnesota	34	8
Mississippi	9	8
Missouri	50	7
Montana	13	8
Nebraska	19	8
Nevada	1	1
New Hampshire	6	7
New Jersey	93	30
New Mexico	8	4
New York	436	96
North Carolina	50	6
North Dakota	10	9
Ohio	108	19
Oklahoma	19	12
Oregon	18	12
Pennsylvania	177	49
Rhode Island	17	4
South Carolina	9	5
South Dakota	10	7
Tennessee	23	6
Texas	91	24
Utah	4	3
Vermont	12	2
Virginia	46	8
Washington	42	9
West Virginia	21	7
Wisconsin	65	23
Wyoming	11	2
Total all hospitals	2,505	602
General hospitals	1,781	443
Other than general	724	159

Reprinted with permission, J. A. M. A. **118**:*1065 (March 28), 1942.*

Western Section of Congress to Postpone Meeting During Emergency

After due consideration and extensive interrogation of the members and others who would support the Western Section Seminar in Physical Therapy, to be held as usual in June, we have come to the conclusion that due to war conditions on the Pacific Coast, it would seem advisable to postpone this Seminar until after the duration.

JOHN S. HIBBEN, M.D.,
Chairman of the Western Section of the American Congress of Physical Therapy.

FRANCES BAKER, M.D.,
Secretary and Treasurer of the Western Section of the American Congress of Physical Therapy.

FRED B. MOOR, M.D.,
President-Elect of the American Congress of Physical Therapy.

Report of National Paralysis Foundation

According to the third annual report of the National Foundation for Infantile Paralysis, more than $805,000 was expended in seventy-two grants and appropriations during the year ended Sept. 30, 1941, to carry on research activities. Of this sum more than $194,000 went to virus research in different medical schools, state health departments and institutions throughout the United States and Canada. Almost $70,000 was used for nutritional research and $84,000 for research for the prevention and treatment of after-effects of poliomyelitis. Since 1934, when the celebrations for President Roosevelt's birthdays were inaugurated, more than $9,000,000 has been collected in the various affairs held throughout the country to observe the occasion. Of this total more than $4,000,000 has been left in communities, $1,467,392.21 has been given to Georgia Warm Springs Foundation, $241,000 has been given to the President's Research Commission, and more than $3,000,000 has been given to the National Foundation since its organization in 1938. The educational program of the foundation has been conducted on two fronts: first, grants have been made to agencies providing continued education to certain professional workers and, second, the foundation itself has engaged in direct education of professional groups and the lay public. In its consideration of the after-effects of infantile paralysis the foundation endorsed the treatment used by Miss Elizabeth Kenny, an Australian nurse, which, in the acute stage, includes the abandonment of splints and immobilization.

Some Mechanical Frauds

Albert Thurlow Hunt and His "Spine Relaxer."—Hunt, a Los Angeles osteopath, for some time sold through the mails what he called "Dr. Hunt's New Cervical Spine Relaxer." According to the Post Office memorandum on the case, the device was found to be a halter attached to rope pulleys and an overhead cross bar. It was to be suspended from a screw-eye at the top of a door and the user, seated below it, placed the broad strap under his chin and fastened the narrow, adjustable strap under the back of the head, using the straight edge of the buckle. He then grasped the free end of the cord above the head, causing a downward pull strong enough to put

all the neck tissues on a vigorous stretch. This treatment was sold "for relief of the functional disorders of head, throat and neck, headache, insomnia, hay fever, nasal catarrh, catarrhal deafness, enlarged tonsils, sinus trouble, pyorrhea, eye troubles, goiter, apoplexy, neck, shoulder and arm neuralgia, and many other distressing conditions are benefited by the improved circulation which the Relaxer produces." The government produced expert medical evidence to show that none of these conditions are curable by any one device but require treatment based on their causes and manifestations. Although Hunt sent the Post Office Department a letter attempting to explain his alleged manipulative system of therapy, he neither appeared at the hearing of the case nor sent any one to represent him. His treatment was found to be a fraudulent scheme to obtain money through the mails, and on Jan. 10, 1940, it was accordingly debarred by a fraud order. Apparently Hunt thereafter used other means than the mails of shipping it, as the Food and Drug Administration at Washington announced on Nov. 28, 1940, that Hunt had been fined $50 for selling his "Relaxer" in interstate commerce with false and misleading claims on the label.

Oscillatherm.—This was put out by an A. E. Ovist and an O. L. Durham, an electrician and a chiropractor, respectively, trading as the Oscillatherm Company of Los Angeles, with a distributing branch at South Bend, Ind. They represented through the mails that their device when used as directed would safely, painlessly and effectively correct and overcome disorders of the prostate gland, restore that organ to a normal, healthy condition that would make surgical operations on the prostate unnecessary, and that it was the "best, safest and most effective" means available to the public for the correction of disorders in its field. The Oscillatherm was found to be an electrically operated mechanism to dilate and heat the rectum and massage the prostate. An expert medical witness for the government testified that a person without medical training would be incompetent to determine just what form of prostatic disorder he had, if any, or how to treat it either with the Oscillatherm or by any other method. The testimony further showed that the Oscillatherm would not effectively correct or overcome prostatitis or other prostatic disorders and that its use would be dangerous in cases in which cancer had already set in in causing the patient to delay scientific treatment. On Feb. 5, 1941, the Post Office Department issued a fraud order against the Oscillatherm Company, J. T. Wharton, manager, and their officers and agents. Thereafter, it appears, Ruth H. Welsh, who was said to manage the South Bend agency, sent out mimeographed form letters to former customers of the Oscillatherm Company informing them that their accounts had been assigned to her. On May 31, 1941, the Post Office extended the original fraud order to cover her name, as R. H. Welsh, on the ground that she was aware of the fraud order against the Oscillatherm Company and was deliberately seeking to circumvent and evade the provisions of it in mailing out the circulars mentioned.—(J. A. M. A. 117:2269 [Dec. 27] 1941).

Medical Practice Acts: Use of Heat Treatment by Chiropodists

Section 24 of the medical practice act of Illinois penalizes any person who holds himself out to the public as being engaged in the diagnosis or treatment of human ailments; or who suggests or prescribes any form of treatment for the cure or relief of any physical or mental ailments of any person with intent of receiving a fee or compensation therefor; or who shall diagnosticate, operate on, profess to heal or treat human ailments or maintain an office for such purpose, if he does not "then possess in full force and virtue a valid license issued by the authority of this state to practice the treatment of human ailments in any manner." The defendants, licensed chiropodists, were charged, in two separate suits which were later consolidated, with having violated the foregoing section in that they applied heat to a patient's arm and treated the blisters which resulted by the use of a hypodermic syringe, a surgical knife and the application of salve. The evidence showed that the complaining witness, accompanied by a friend, went to the defendants' shoe store and that one of the defendants wrapped a hose or cable around her shoulder, arm and wrist and turned on a machine which produced heat. After heat had been applied for some time the cable or hose was removed and it was discovered that four or five blisters had resulted from the treatment. One of the defendants opened two of the blisters with a knife, applied a green salve, bandaged the arm and directed the patient not to remove the bandages for two or three hours. On completion of the treatment, the patient paid the defendant $5 to cover the initial treatment as well as one future treatment. Because of pain caused by the blisters, the patient returned to the defendants for treatment, one of whom then used a hypodermic syringe to draw liquid from the blisters, washed the burns, applied green salve to the sores and again bandaged the arm. From judgments of conviction, which were affirmed by the appellate court, the defendants appealed to the Supreme Court of Illinois.

The defendants first contended that, since they were licensed to practice chiropody, they were not persons who did not possess a license to treat human ailments "in any manner," and were therefore not violating section 24. The Supreme Court held that the defendants had clearly misconstrued the words "in any manner." Those words, said the court, require a person to have a valid license to practice the treatment of human ailments in the manner in which such treatment is practiced. The construction urged by the defendants, continued the court, would authorize a licensed chiropodist to practice surgery, or even the most intricate branches of medical treatment, simply by virtue of his chiropody license. The court therefore held, in effect, that,

since the defendants were not licensed to practice as they did, it did not matter what other acts they were entitled to perform. The defendants next contended that a mere isolated instance of treatment did not prove that they were engaged in the practice of medicine. The Supreme Court said, however, that the acts enumerated in section 24 were in the disjunctive and that the commission of any one of them, without possessing the proper license, was a violation of the law. Finally, the defendants contended that the evidence was not sufficient to prove them guilty beyond a reasonable doubt. The Supreme Court held that the trial judge and jury had seen and heard the witnesses and were in a better position to determine their credibility. The mere fact that the defendants' evidence was contradictory to the state, said the court, constitute no grounds for reversal. The judgments of conviction were therefore sustained. — *People v. Friedman (two cases), 29 N. E. (2d) 89 (Ill., 1940).* — *Reprinted with permission, J. A. M. A.* **118**:*1398 (April 18) 1942.*

Twenty-First Annual Conference of the American Physiotherapy Association at College Camp, Williams Bay on Lake Geneva, Wisconsin June 28-July 3, 1942

The dates are Sunday, June 28, through Friday, July 3. The place is College Camp, Williams Bay, on Lake Geneva, Wisconsin. College Camp is an outstanding conference and vacation center located in one of the most beautiful inland lakes, Lake Geneva. The picturesque location, the extensive facilities for recreation and conference meetings, as well as the comfortable accommodations and delicious meals, make it an ideal spot for our annual conference. On the next page you will find information concerning the reasonable rates and recreational facilities. In order to be assured of the reservation you wish, make your reservation early.

The customary $1.00 conference fee will be charged Members of the Association. The conference fee for Non-Members is $2.00.

Program Schedule

Sunday, June 28

2:00-6:00 P.M. **Registration.**

6:00 P.M. **Get-together Supper — Illinois and Wisconsin Chapters, Hostesses.**

7:30-9:30 P.m. **Business Meeting.**

Monday Through Thursday, June 29-July 2

7:15 A.M. **Breakfast.**

8:00-10:00 A.M. **Physical Therapy Treatment in Infantile Paralysis.**

Discussion based on the results of the recent survey under a grant from the National Foundation for Infantile Paralysis.

Discussion Leader, *Jessie L. Stevenson,* Orthopedic Consultant, National Organization for Public Health Nursing, New York City.

Consultant — *Verne T. Inman,* M.D., University of California, Berkeley.

Other participants will be announced.

10:30-12:30 **War Injuries.**

Discussion based on the most common types of war injuries in World War II, together with their Physical Therapy treatment.

Discussion Leader, *Mildred Elson,* office of Emil Hauser, M.D., Chicago, Illinois.

Consultant — *John S. Coulter,* M.D., Northwestern University Medical School; Chairman, Sub-Committee on Physical Therapy, National Research Council.

Other participants will be announced.

12:30-2:00 P.M. **Luncheon.**

2:00-3:30 P.M. **Applied Anatomy.**

Verne T. Inman, M.D., will discuss anatomy applied to Physical Therapy. Dr. Inman has done extensive work in Applied Anatomy, in which field he made a most interesting contribution to the 1941 Conference.

3:30-6-00 P.M. **Rest and recreation.**

College Camp has extensive facilities for recreation. It is suggested that individuals bring their own personal sports equipment—tennis racquets, golf clubs, etc. The Illinois and Wisconsin Chapters will organize these hours so that the members of the conference may take advantage of the opportunities offered. For instance, on one afternoon a boat trip around the lake is planned.

6:00-7:00 P.M. **Dinner.**

7:00-9:00 P.M. **Crippled Children's Schools Section.**

This group requested the formation of a Section last year. Their program will be announced.

Chairman, *Ida May Hazenhyer,* Jahn School, Chicago.

Physical Therapy Schools Section.

The discussion will center around a preliminary report of the Survey of Course Content in Physical Therapy Schools.

Chairman, *Evelyn Anderson,* Stanford University, California.

Allied Council.

The American Physiotherapy Association has asked representative organizations having similar problems to discuss matters of common interest and helpfulness. This group will report its deliberations to the entire conference on Friday morning.

Discussion Leader, *Hazel E. Furs-*

cott, National Relations Chairman, San Francisco.

Friday, July 3, 1942

8:00-10:00 A.M. Report from the Allied Council. This report will take the form of a panel discussion and will give opportunity for discussion from the floor.

Discussion Leader, *Hazel Furscott*.

10:30-12:30 Business Meeting.

Proposed Rates
College Camp, Williams Bay, Wis.
June 28, 1942, Evening Meal, to July 3, 1942, Noon Meal

		Rates Per Person Per Day	Per Period
Tents. Horseshoe Row.	Double	$3.00	$13.50
	Single	3.25	14.65
Ridge and Valley.	Double	3.25	14.65
	Single	3.75	16.90
Lake Front.	Double	3.50	15.75
	Single	4.00	18.00
Cottages Without Bath.	Double	3.75	16.90
	Single	4.25	19.15
Cottages With Bath.	Double	4.50	20.25
	Single	5.25	23.65
Private Suite Cabins.	Double	5.00	22.50
	Single	6.00	27.00

(Please Send in Your Reservation Early!)

Recreational Facilities include: Archery, Arts and Crafts, Badminton, Bicycling, Boat Rides, Fishing, Golf, Hiking, Horseback Riding, Horseshoes, Rowing, Sailing, Shuffleboard, Swimming, Table Tennis, Tennis, Volley Ball.

The 18-hole Golf Course with Club House is one of the main attractions. Guests find it very convenient to have such a fine course on the grounds. The rates are reasonable, and rental clubs are available. It is suggested you bring your own personal sports equipment. Be sure to bring your slacks, shorts, swimming suits, and other sports clothing to suit your own needs.

Graduate Program in Physical Therapy at Northwestern University Medical School (Sponsored by the American Physiotherapy Association)

July 6-24, 1942

Schedule of Classes

Human Physiology. Lecture and demonstration course on the physiology of muscle action, circulation, respiration, and the central nervous system.

Two semester hours (F. T. Jung, M.D.). Lecture, 9:00-10:30 A.M. Laboratory, 1:00-4:30 P.M.

Tuition, $25.00.

Applied Anatomy. A course of advanced study of muscle function. Lecture, 8:00-9:00 A.M. Lecture, 10:30-11:30 A.M.

Tuition, $20.00.

Use of Physical Therapy in Injury. A lecture course including the study of injury to the back, arm and shoulder, hand, leg and foot from an anatomical, physiological, and pathological viewpoint; the surgical treatment and the application of Physical Therapy in these injuries.

Two semester hours (Harry E. Mock, M.D.), (Sumner L. Koch, M.D.), (Paul B. Magnuson, M.D.), (Emil D. W. Hauser, M.D.), 5:00-6:00 P.M.; (John S. Coulter, M.D.), 7:00-8:00 P.M.

Tuition, $20.00.

Application for Admission

All students must file an application blank for admission. State that you wish to make application for the course sponsored by the American Physiotherapy Association. Applications must be received before June 1, 1942. An advance payment of $5.00 is required when the application is approved. This payment is not returnable but is credited on the tuition fee.

Registration

Credit cannot be obtained for more than 4 semester hours during this period of three weeks. A registration fee of $5.00 will be required at the time of registration. Registration will take place July 6.

Living Accommodations

Reasonable rates as follows have been arranged at the Allerton Hotel, which is two blocks south of Northwestern University Medical School:

	Weekly Per Person
Double rooms with hot and cold running water (twin beds—two persons)	$6.00
Double rooms with running water and toilet (twin beds—two persons)	12.00
Double rooms with private baths (twin beds—two persons)	15.00
Single rooms with hot and cold running water	14.00
Single rooms with running water and toilet	15.00

The hotel maintains a modern and convenient cafeteria serving excellent food at reasonable prices.

Due to the expected congestion in that area because of other groups that will be in Chicago during the same period, it is urgent that reservations be sent to the hotel immediately.

All communications regarding this course and applications should be directed to the Dean of the Northwestern University Medical School, 303 East Chicago Avenue, Chicago, Illinois.

Special Exhibit on Backache, Atlantic City Session of the American Medical Association

At the request of the Committee on Scientific Exhibit of the Board of Trustees of the American Medical Association a special exhibit on backache will be presented under the auspices of an exhibit committee composed of:

Frank R. Ober, Boston, Chairman.
Carl E. Badgley, Ann Arbor, Mich.
J. Archer O'Reilly, St. Louis.
Arthur Steindler, Iowa City.
Philip D. Wilson, New York.

With the collaboration of

Eben J. Carey, Milwaukee.
Albert Ferguson, Brookline, Mass.
H. Close Hesseltine, Chicago.
K. G. Hansson, New York.
Theodore A. Willis, Cleveland.
Walter Zeit, Milwaukee.

And an advisory committee consisting of

Fremont A. Chandler, Chicago.
H. Earle Conwell, Birmingham.
John S. Coulter, Chicago.
Philip Lewin, Chicago.
Robert D. Schrock, Omaha.
E. Harlan Wilson, Columbus, Ohio.
Walter J. Zeiter, Cleveland.

The exhibit deals with the following factors:

1. Anatomy. Eben J. Carey and Walter Zeit.

Specimens and demonstrations illustrating anatomy of the spine.

2. Pathology. Theodore A. Willis.

Specimens and demonstrations illustrating common pathologic disturbances which are concerned in backache.

3. Physical Examinations. Frank R. Ober.

Diagrams and demonstrations illustrating methods of physical diagnosis.

4. Roentgen Ray Technic. Albert Ferguson.

Diagrams and roentgenograms in atlas form.

5. Neurologic Examinations. Carl E. Badgley.

Illustrations and demonstrations covering the neurologic aspects of backache.

6. Visceral Disturbances. H. Close Hesseltine.

Illustrations and demonstrations dealing with visceral disturbances as found in internal medicine, obstetrics, gynecology and urology.

7. Physical Therapy. K. G. Hansson.

Illustrations and demonstrations presenting physical therapy aids in the treatment of backache.

8. General Treatment. Frank R. Ober.

Apparatus and operative treatment for backache, with demonstrations at 10:30 and 3:30 each day, followed by general discussions concerning the use of corsets, braces and the like.

A pamphlet has been prepared for distribution which gives the essential points of the exhibit.

In addition to the physicians in charge of each booth, a competent corps of demonstrators will be present continuously throughout the week.

R. L. Anderson, Charleston, W. Va.
Joseph L. Baer, Chicago.
Samuel W. Banks, Chicago.
C. Glenn Barber, Cleveland.
Hans J. A. Behrend, New York.
E. J. Berkheiser, Chicago.
Albert L. Bershon, Toledo, Ohio.
Walter P. Blount, Milwaukee.
A. Leo Brett, Boston.
A. H. Brewster, Boston.
Lloyd T. Brown, Boston.
Herbert L. Brumbaugh, Dayton, Ohio.
B. Franklin Buzby, Camden, N. J.
John Coulter, Chicago.
James A. Dickson, Cleveland.
Joseph A. Freiberg, Cincinnati.
Robert V. Funsten, Charlottesville, Va.
Ralph K. Ghormley, Rochester, Minn.
Elmer Hess, Erie, Pa.
Louis G. Howard, Boston.
M. Beckett Howorth, New York.
Lyman H. Hoyt, Boston.
S. Leon Israel, Philadelphia.
Joseph W. Kelso, Oklahoma City.
H. Worley Kendell, Dayton, Ohio.
Samuel Kleinberg, New York.
Miland E. Knapp, Minneapolis.
Richard Kovacs, New York.
Frank Krusen, Rochester, Minn.
R. M. Le Comte, Washington, D. C.
Raymond E. Lenhard, Baltimore.
Albert A. Martucci, Philadelphia.
Madge C. L. McGuinness, New York.
Alexander Miller, Fort Dix, N. J.
James Raglan Miller, Hartford.
John B. Montgomery, Philadelphia.
John Royal Moore, Philadelphia.
I. William Nachals, Baltimore.
Joseph B. Nylin, Philadelphia.
Walter L. Palmer, Chicago.
Louis E. Papurt, Cleveland.
Kenneth Phillips, Miami, Fla.
Maurice M. Pike, Hartford, Conn.
S. L. Raines, Memphis, Tenn.
Fowler B. Roberts, Akron, Ohio.
Lewis C. Scheffey, Philadelphia.
William H. Schmidt, Philadelphia.
William Snow, New York.
Bror S. Troedsson, New York.
C. G. Weller, Aurora, Ill.
Walter J. Zeiter, Cleveland.

Reprinted with permission, J. A. M. A. **119**:*60 (May 2) 1942.*

Indiana State Personnel Division Needs Qualified Physical Therapy Technicians

In order to establish an eligible list from which to fill present and future vacancies for qualified physical therapy technicians, the Indiana State Personnel Division announces an unassembled examination. Residence in Indiana is not required. For further details and application form write the Indiana State Personnel Division, 141 South Meridian Street, Indianapolis, Indiana.

Medical Diathermy Short Wave Sets to Be Registered by Federal Communications Commission

Medical diathermy short wave sets will be registered by the Federal Communications Commission as an antiespionage precaution. Such apparatus is readily convertible into radio transmitters. Of a total of 75,000 units, between 50,000 and 60,000 are in hospitals and physicians' offices. FCC may decide to confiscate sets in other hands. — (*Business Week*, April 25, 1942.)

BOOK REVIEWS

A TEXTBOOK OF SURGERY. By American Authors. Edited by *Frederick Christopher*, B.S., M.D., F. A. C. S., Associate Professor of Surgery, Northwestern University Medical School; Chief Surgeon, Evanston (Illinois) Hospital. Third edition. Cloth. Pp. 1764 with 1538 illustrations. Price, $10.00. Philadelphia and London: W. B. Saunders Company, 1942.

There are one hundred ninety-five contributors to this popular textbook of surgery. This third edition has been completely revised and reset. There are several important changes. The subject of war injuries has assumed compelling importance and the obligation of all students and surgeons to inform themselves on this subject has necessitated the inclusion of an entirely new section by Dr. Robert I. Harris of the University of Toronto, whose experience and information qualify him for the task. There is an entirely new section on anal pruritis and hemorrhoids by Dr. Newton D. Smith of the Mayo Clinic. Dr. Albert Blalock of Johns Hopkins Medical School has contributed a new section on abnormalities of the thymus. Other important new sections are those on compound fractures by Dr. Robert H. Kennedy of Columbia University and on coccidioidal granuloma by Dr. Hiram E. Miller of the University of California. The section on the spleen has been rewritten and rearranged by Dr. Paul Reznikoff of Cornell University Medical School. Dr. Claude S. Beck of Western Reserve University School of Medicine has contributed a section on the treatment of patent ductus arteriosus. The section on fractures is most complete starting with a general discussion by Robert H. Kennedy and a consideration of the pathology and repair of fractures by Clay Robert Murray and ending with a section on physical therapy by John S. Coulter. The most outstanding recent advance in surgery is the application of the sulfanamide group of drugs. The indications for their use and the beneficial effects which may be expected of them in many conditions have been carefully described by the various contributors. The volume is highly recommended to medical students and practitioners as a complete but concise presentation of surgery by authorities on each subject.

ANALYSIS OF HUMAN MOTION. A TEXTBOOK IN KINESIOLOGY. By *M. Gladys Scott*, State University of Iowa. Cloth. Pp. 388. Price, $3.90, with illustrations. New York, N. Y.: F. S. Crofts & Co., 1942.

Dr. Scott has approached the subject of kinesiology from a functional point of view. She first lays the ground work for an understanding of the basic fundamentals of movement—articulations, muscular action, the related phases of the physiology of movement and the related principles of mechanics. She then considers the detailed mechanical and anatomic analysis of a selected group of activities, including the more common ones, stressing the method in order to facilitate similar analyses of other activities by the student. Finally Dr. Scott lays the basis for the application of kinesiology to problems of posture training and prevention of injuries and to the analysis of currently used tests and measurements. This book will help the student to understand better the mechanism with which he deals and to acquire an analytic attitude toward motor actions. It is designed for the student of kinesiology and physical education, as well as being of interest and value to others of the medical profession as the orthopedic surgeon, physical and occupational therapeutist who treat congenital deformities or those resulting from disease or injury. They must know not only the cause of the injury, but the reactions to expect from the muscles in order to aid in muscle reeducation and rehabilitation of the patient.

CLIMATE AND MAN. YEAR BOOK OF AGRICULTURE. United States Department of Agriculture, *Claude R. Wickard*, Secretary. Cloth. Pp. 1248. Price, $1.75. Washington, D. C.: United States Government Printing Office, 1941.

This year book is the sixth in a series designed as a set of reference volumes for modern farmers dealing with all the important aspects of present-day agriculture in the United States. The distinction between climate and weather is more or less artificial, since the climate of a place is merely a build-up of all the weather from day to day and the weather a day-by-day breakdown of the climate. It seems to be a useful distinction, however, and there will probably continue to be meteorologists who will concentrate on the daily weather and climatologists who will concentrate on the longer time range. The importance of climate and weather to agriculture hardly needs to be emphasized.

The book is divided into five parts. Part I considers climate as a world influence. It gives some of the evidence concerning long time changes in climate during the history of the earth. It shows how climate divides the world into regions that have different kinds of natural vegetation, soils and types of agriculture. Part II, climate and agricultural settlement, there is presented the part climate has played in the lives of those who settled the United States, shaping the agriculture and their ways of doing in each major climatic region. It is shown that the original settlers came from regions in Europe with climatic conditions not too unlike those they found in the eastern and midwestern parts of the United States, so that they could establish their native customs, which, in turn, had been strongly

influenced by the climates they knew back home, to the new land.

Climate and the farmer is the title of part III. It deals in considerable detail with the effects of weather and climate on each of the major and many of the minor crops produced by the farmers in the United States and, in addition takes up the problems of the production of livestock, and other problems pertaining to soils, forestry, diseases of plant, insects and animal parasites in relation to climate.

Part IV, the scientific approach to climate and weather, takes up floods and forecasting of floods, and discusses land use practices in relation to flood control, tells how our daily weather forecasts are made and finally gives a résumé of the present state of our knowledge of the physical forces back of the whole range of weather phenomena.

In part V climate data is so arranged that farmers almost anywhere should be able to find the particular facts about their own locality or the one nearby. The volume is of interest to farmers and climatologists.

MENTAL HYGIENE FOR COMMUNITY NURSING. By *Eric Kent Clarke*, M.D., F.A.P.A., Director of the Psychiatric Clinic for Children; Professor of Psychiatry and Pediatrics, University of Minnesota Medical School, Formerly Associate Professor of Medicine and Director of the Division of Psychiatry, School of Medicine, University of Rochester, New York; Psychiatrist for Health Bureau, City of Rochester. Cloth. Pp. 262. Price, $3.50. Minneapolis: The University of Minnesota Press, 1942.

The present day advanced knowledge of mental hygiene demands that all those rendering health service to persons should be able to recognize mental illness and be aware of its far-reaching effects. The author has incorporated his wide clinical and teaching experience with children and adults in normal and abnormal times, in a volume primarily for the community nurse, but of sufficient general interest to all physicians, social workers and technicians. He gives authoritative interpretation to what lies behind various mental maladjustments. He points out how by early recognition of mental conditions the nurse may help to coordinate the work of all agencies engaged in the task of guidance, treatment, education and mental hygiene. The main theme of the volume is a description of the behavior problems of all age groups, beginning with preschool age. Its successive chapters are "The Preschool Child," "The Child at School," "The Handicapped Child," "The Adolescent" and finally "The Family." All of the chapters are greatly enlivened by an inclusive gorup of personal histories of children of all ages as well as of adults. The last four chapters are: "The Convalescent and the Chronic Invalid," "The Psychoneurotic" and "The Psychotic," "Community Care of the Feeble Minded" and "The Mental Hygiene of the community Nurse." Clarke's volume is well written and will give useful information to all engaged in safeguarding public health.

FOUR TREATISES OF THEOPHRASTUS VON HOHENHEIM CALLED PARACELSUS. Translated From the Original German, With Introductory Essays. By *C. Lilian Temkin; George Rosen, Gregory Zilboorg* and *Henry E. Sigerist.* Edited with a Preface by *Henry E. Sigerist.* Cloth. Pp. 256. Price $3.00. Baltimore: The Johns Hopkins Press, 1941.

Philip Theophrastus Bombast Hohenheim who later called himself Paracelsus was one of the most forceful and most misunderstood personalities of the Renaissance. With the publication of four of his main treatises Dr. Sigerist and his coworkers have again given us a most absorbing piece of medical history. The preface written by Dr. Sigerist describes Paracelsus as a scientist and a mystic, a rebellious spirit against medieval medicine which had degenerated and was ripe for reformation. Travelling all over Europe seeking information and of keen observation he developed his own system of medicine and a philosophy and theology of his own, conceiving disease in different terms than heretofore and applying in his therapy drugs, particularly chemical compounds, many of which had not been used before. The violent tirades he directed against physicians met equally violent opposition; there was a deliberate conspiracy against him as an author and only a few of his works, and not the most important, were published during his lifetime. The translations edited by Sigerist have been published in commemoration of the four hundredth anniversary of Paracelsus' death and show different aspects of his works. The first one: "Seven Defensiones. The Reply to Certain Caluminations of His Enemies" was translated by C. Lilian Temkin, who wrote her own preface. This work is a passionate justification of Paracelsus' character, activities and views and gives a splendid picture of the man and of his basic ideas. The second treatise: "Miners' Sickness and Other Miners' Diseases," translated by George Rosen, is the first monograph ever written on the diseases of an occupational group and thus became the starting point of a new line of medical literature. It has chapters on lung sickness, on metallic smoke, on the diseases of salt ores and on quicksilver diseases and their cure. The third treatise: "The Diseases That Deprive Man of His Reason, Such as St. Vitus' Dance, Falling Sickness, and Insanity, and Their Correct Treatment" carries an introduction by George Zilboorg and is also a pioneering book. Apparently unfettered by any of the established practices of the medical law of his day, Paracelsus was not afraid to admit that he was observing a new aspect of a disease whenever he stumbled upon one. He was not unaware of the fact that mental disease is a highly individual phenomenon. These views were ahead of his time, a time which was not yet ripe to recognize the value of the individual and therefore still less to formulate the concept of personality. The last contribution is a translation of "A Book on Nymphs, Sylphs, Pygmies and Salamanders and on the Other Spirits," with an introduction by Sigerist. It is written at times in a style reminding one of fairy tales. It vividly portrays not only Paracelsus' philosophic and theologic views but what may be

almost regarded as an evidence of the survival of paganism in christianity.

Sigerist and his coworkers stated that the translation into modern English from the 16th Century German of Switzerland and later into Latin produced at times almost unsurmountable difficulties. Therefore so much more credit is due these workers from the Institute of Historical Medicine of Johns Hopkins University. American medicine can become of age only if it is fully aware of the close relation of medical history to all progress. In the development of modern medicine Paracelsus' character and works played a definite role and hence the study of the volume should be a stimulus to all students of medicine.

A MANUAL OF THE TREATMENT OF FRACTURES. By *John A. Caldwell*, M.D., Professor of Clinical Surgery, College of Medicine, University of Cincinnati; Director of the Fracture Service, Cincinnati General Hospital, Cincinnati, Ohio. Cloth. Pp. 150 with 76 illustrations. Price, $3.50. Springfield, Ill.: Charles C. Thomas, 1941.

This is an excellent manual on the treatment of fractures for medical students, house officers and general practitioners. The author states that the purpose has been to elucidate principles of procedure rather than to describe specific methods. At the end of each chapter there is an excellent critical list of references for supplemental reading. The illustrations are good line drawings and add greatly to the text. The directions are brief but specific and throughout the author has endeavored to help the seeker of information to use his eyes, hands and reason instead of applying some specific gadget. In these days of frequent accidents every general medical practitioner must have a ready reference for the treatment of fractures. This concise volume can be recommended for describing the best treatment for each fracture and for pointing out the errors of poor management.

THE INTERVERTEBRAL DISC. By *F. Keith Bradford*, M.D., Houston, Texas, and *R. Glen Spurling*, M.D., Louisville, Kentucky. Pp. 158 with 45 illustrations. Cloth. Price, $4.00. Springfield, Illinois: Charles C. Thomas, 1941.

In this well written and well illustrated monograph, the authors have combined observations from their own experience with those of other writers on intervertebral disks. The short discussion concerning historical development, embryology, anatomy, physiology, mechanics and pathology will prove valuable to the experienced clinician. The presentation concerning the examination, findings, and differential diagnosis in cases of protrusion in the lumbar region (by far the most frequent site of occurrence) is of great theoretical value. Unfortunately, the emphasis on positive findings may mislead the average reader. The authors' statement that "those patients with severe persistent sciatica and low back pain who have had other causes excluded as thoroughly as possible will, in a high percentage of instances, prove to have herniation of the nucleus pulposus" could bear more emphasis.

The literature is reviewed extensively and comments are made on it in the light of the authors' experience with approximately 150 cases of proved protrusions of discs. The occasional didactic and somewhat dogmatic criticism does not appear wholly warranted. Similarly, the omission of the roentgenographic technic for the demonstration of protruded disks by the use of air as a contrast medium is unfortunate, where as the recommendation that the quantity of lipiodol injected be limited to 2 cc. will not find general agreement. The work is completed with a short outline of surgical technic and a discussion of results of treatment in which some of the more common pitfalls are emphasized. The inclusion of thirteen brief case histories will be of particular value to those who are unfamiliar with this clinical entity.

PSYCHOLOGICAL EFFECTS OF WAR ON CITIZEN AND SOLDIER. By *R. D. Gillespie*, M.D., Physician for Psychological Medicine, Guy's Hospital, London; Wing Commander, Royal Air Force Volunteer Reserve. Cloth. Pp. 251. Price, $2.75. New York: W. W. Norton Company, Inc., 1942.

This book is based on lectures which were delivered in memory of Colonel Thomas W. Salmon, Medical Corps, U. S. Army, who was responsible in the War of 1914-1918 for advising our government of the United States on the organization of the psychologic services in the Army. The subject matter is concerned with general principles and issues that are raised by the occurrence of another world cataclysm and refers especially to the psychologic aspects of its causation and to the question of what can be done to prevent in some fundamental fashion its repetition. The following subjects are considered: changing concepts, constitutional factors and social factors in psychoneuroses; psychoneuroses among civilians in war and in the fighting forces morale—individual and national; and human relationship in the post-war world. The author, who is one of England's foremost psychiatrists, presents his first-hand observations on the psychologic effects of modern warfare on the armed forces and on the civilian population. These observations are of inestimable value to Americans in formulating plans for maintaining civilian morale as well as for avoiding mental breakdown among troops. The author attributes the remarkably few cases of psychoneuroses in the Royal Air Force to the extreme care which is used in selecting its members, stressing the strict mental and physical examination given before induction. Moreover, he points out, there are fewer neurotics in this war than in the last since now greater importance is attached to the individual. Among civilians, the common sharing of danger in air raid shelters has helped people withstand mental disturbances. On the other hand, among the significant symptoms of psychoneuroses is the apathy noted in the battleworn soldier as well as in those whose lives have been completely disorganized. Also discussed are different effects of economic condition, relation of unemployment to neurosis, reactions of children and the unexpected transformation of some previously neurotic persons under the challenge of peril.

PHYSICAL THERAPY ABSTRACTS

The Action of Exercise on Ketosis. Douglas R. Drury; Arne N. Wick, and Eaton M. MacKay.

Am. J. Physiol. **134**:761 (Nov.) 1941.

In recent years evidence has been accumulating that the ketone bodies are, on occasion, an important step in the catabolism of fat. There is much support for the view that the liver at certain times partially oxidizes fatty acids to form these ketone bodies which are then supplied to the other tissues of the body as an important fuel. A large fraction of the energy turnover of the muscles may under certain conditions be supplied by oxidation of these substances. It would seem likely then that individuals in a state of ketosis would show a decrease in its intensity (which has ordinarily been measured by urinary ketone excretion) as a result of exercise. This has not been found to be entirely the case for periods of exercise lasting an hour or more. These seemingly contradictory findings may be reconciled if we can accept the assumption already stated in papers from these laboratories that muscular activity not only causes increased burning of these bodies but also increased production of them by the liver.

With rats, in a state of ketosis, a short bout of heavy exercise causes an immediate drop in the ketone level of the blood. During a period of three to four hours thereafter there is a phase of over-production of ketone bodies so that the blood values for exercised animals go to higher levels than in controls. These results support the view that in states of ketosis exercise increases the oxidation of ketone bodies and also causes the liver to produce them at a higher rate. In man these changes were not demonstrated for light exercise. The drop during heavy exercise was obtained.

The Photo-Sensitizing Action of Buckwheat (Fagopyrum Esculentum). Harfiette Chick and Philipp Ellinger.

J. Physiol. **100**:212 (Sept.) 1941.

Buckwheat, *Fagopyrum* (nat. order Polygonaceae), has been known in Europe for at least four centuries as a food for human beings and animals, which occasionally gives rise in the latter to a disease known as fagopyrism. This occurs in sheep, pigs, cattle, goats and horses, and has been produced experimentally in rabbits, guinea pigs, mice and rats. Only albino or partially pigmented animals are affected and exposure to light is necessary. The symptoms include erythema, with itching, of the less pigmented parts of the skin, which may be followed by roughness of the fur with loss of hair; eventually necrosis of areas of the skin may occur. Similar changes have been observed in the mucous membranes, and in severer cases the nervous system may also be affected, and convulsions with paralysis of the limbs and respiratory muscles may cause death. Hertwig (1833) first recognized the connection of the disease with exposure to sunlight of the unpigmented parts of the skin and Darwin (1868) also discussed the immunity of pigmented animals.

The wavelength of the rays which evoked a reaction in the rats sensitized with buckwheat were found to lie between 540 and 610 millimicrons. The sun's rays are powerful in this region and well suited to test buckwheat sensitivity, the drawback being the continual change in intensity, and the impossibility of recording it without exact instruments. The radiation from the mercury-vapour lamp has low intensity in rays of the foregoing wavelength; that from the carbon arc is rich and well suited for tests, but equal and intense illumination can only be obtained over a small area. The gas-filled electric light bulb also has powerful emission in the critical zone and would be the most suitable for tests if the intensity could be obtained sufficient great. To avoid heat effects the rays should always be filtered through water or a solution of copper sulphate.

The authors in their summary state: (1) Buckwheat (Fagopyrum esculentum) contains in the flower, especially when young, and in the husk of its seed, photosensitizing pigments, which could not be detected in the leaves and stems, in the doses given, or in the buckwheat flour. (2) Feeding of buckwheat flowers or of the husks of the seeds renders partly or wholly unpigmented rats and mice sensitive to light rays of wavelengths between 540 and 610 millimicrons. (3) The symptoms of this light disease, fagopyrism, observed in rats and mice were inflammation of the unpigmented portions of the skin particularly on the ears, nose, paws and tail, and of the mucous membranes (conjunctivitis, diarrhoea), and affections of the central nervous system (convulsions). (4) The photosensitizing agent has a well defined minimum activating dose, viz. about 0.25 Gm. dried buckwheat flowers per 100 Gm. animal. The total amount was the same whether given in a series of small daily doses or in one single dose. In the latter, sensitivity to light was present within twenty-four hours after the intake and lasted for a considerable time, this time being in proportion to the size of the dose given. (5) The activating principle could be extracted from dried buckwheat flowers with mixtures of 10 parts of glacial acetic acid with 90 parts of methanol or glycol, and was found present in the water-insoluble portion of the dialysate of the extracts. It was soluble in alcohol with reddish fluorescence. It was easily destroyed by heat or alkali and was extractable to a very small degree, or not at all, by most of the usual solvents.

Studies in Exercise Physiology. Craig Taylor.

Am. J. Physiol. 135:27 (Dec. 1) 1941.

The author presents his summary and conclusions in three sections. Section I. (1) Heart rates in the steady state of exercise of forty-five minutes' duration reach a level depending on the intensity of the work but continue to rise slightly throughout the experiment. They do not, in the typical case, maintain an absolutely steady state. Equations for this slope are given for 2 subjects in 24 experiments each. (2) Significantly high correlations (0.969 ± 0.013 and 0.955 ± 0.020) were found between heart and work load for the 2 subjects.

Section II. (1) Circulatory and respiratory responses of 3 male and 2 female subjects were studied in work experiments lasting thirty minutes. (2) All functions except heart rate tend to reach a plateau at not later than ten minutes of exercising time and fluctate somewhat about a horizontal curve. Heart rate, as shown in the report, slowly rises throughout the experiment. (3) Equations are given for the regressions of heart rate, systolic pressure, diastolic pressure, pulse pressure and total ventilation on work load in the reports of the 3 male subjects. Curvilinear relations in these functions precluded the calculation of these values for the 2 female subjects. (4) A comparison of the responses of male and female on an equal basis of weight shows that significant differences occur only in the heart rate and the respiratory rate and which are higher in the latter.

Section III. (1) The circulatory, respiratory and metabolic responses of a group of subjects to a periodically increasing work load on a bicycle ergometer were studied. All experiments were continued uninterruptedly until the subject was forced to quit from exhaustion. (2) Heart rate, total ventilation, oxygen consumption, and respiratory quotient increase with work load in approximately linear fashion. The slope of the regression line and the ultimate level reached are individual variables. (3) The behavior of these functions at the approach of exhaustion is determined by comparing trends throughout the range of work loads to the trend at the uppermost step at which exhaustion occurs. The exhaustion trends of metabolic and circulatory functions are lacking in uniformity. Total ventilation, on the other hand, most often becomes markedly excessive. (4) The alveolar pCO_2 and the per cent CO_2 in expired air each increase in the transition from rest to work, remain on a fluctuating plateau throughout most of the work range and decline sharply at exhaustion. These variables as well as ventilation most reliably signal the onset of exhaustion in an objective fashion. (5) The roles of efficiency and magnitude of oxygen consumption at the crest load in determining total work capacity have been shown graphically. (6) The step-up experiment offers promise in the measurement of the important physiologic factors underlying individual physical capacity for sustained heavy exercise.

The Thermionic Control of Electric Currents in Electro-Medical Work. P. Bauwens.

Proc. Roy. Soc. Med. 34:715 (Sept.) 1941.

When one considers the various fields where thermionic valves have been adopted for the control of electric currents on account of their wide range of applicability, it is surprising that they have not made their appearance in electrotherapy except in rectifying and oscillating circuits.

It is interesting to study those properties of valves which might be exploited and the advantages which might accrue from their use in controlling or modifying the flow of current in direct current circuits. The simplest type of valve is the diode. It consists of two electrodes enclosed in an evacuated space. One of these is heated electrically and is referred to as the cathode. It acts as an emitter of electrons. The other, or anode, is merely a plate or a cylinder in its vicinity. When a diode is connected up to a source of direct current in such a way that the cold electrode, or anode, is positive in relation to the cathode, a current will flow. Its magnitude will depend on a number of factors, such as the distance between the electrodes and their dimensions. As in other circuits, the current is a function of the E.M.F., but in this case, this relation only holds good within certain limits, for the number of electrons available for the transmission of the current across the gap between cathode and anode is determined by the temperature of the cathode. Once all the electrons emitted are being used, further increase in the E.M.F. produces no change in the current and the valve is said to be saturated.

When galvanic currents are employed for electrotherapeutic purposes, they are as a rule controlled by means of potentiometers, cell collectors, or resistances, and in such cases the value of the current is greatly influenced by the impedance of the patient, which is all but constant. The changes of resistance in the superficial layers of the skin are so great that they can be measured by means of an ordinary milliampere meter; nor are these of any importance in the application of unmodified galvanism. They do, however, become a source of error when testing muscles and nerves. Every time the active electrode is moved, the value of the current varies, rising at each closure of the circuit until the resistance of the patch of skin immediately under the electrode has broken down and become constant.

This can be minimized by adequate soaking of the skin, and by having resistance in the circuit of such magnitude as to render negligible these variations of resistance in the skin. This coarse variation is not the only one to be contended with. One which is undetectable by ordinary methods causes the current to drop very rapidly almost as soon as it is made. It does not result from a change in resistance but from the production of a back E.M.F. developed by the banking up of ions on either side of polarizable membranes.

It must be remembered when testing muscle with apparatus in which the galvanic current is controlled by means of a potentiometer that the response obtained may have been produced either by the high peak of short duration or by the more prolonged current of lower intensity, according to the excitability characteristics of the tissues under test.

Electro-Shock Therapy. Walter J. Otis.

New Orleans M. & S. J. **94**:239 (Nov.) 1941.

The author has found a special apparatus (Rahm), which conforms to the requirements of electrology necessary in producing the convulsive shock.

The method involves production of a convulsion by the application of a known potential difference for a known period of time between the frontotemporal regions. The apparatus comprises (1) system of electrodes by which the current is applied to the head; and (2) the control apparatus by which the electric characteristics of the situation are controlled.

The convulsion thus induced is a typical epileptic attack. On induction of the current, the patient loses consciousness and without an initial outcry the patient passes into a marked tonic convulsion with the trunk, legs, arms and hands in spastic semiflexion. Shortly clonic contractions follow and are of varying degree. Five minutes after the shock the patient answers, although still somewhat stuporous, and from eight to ten minutes later is restored. There remains a somnolent tendency. The advantages of this method are immediate and complete loss of consciousness, which persists for the duration of the shock. There is no excitement. The circulation is not affected except for slight acceleration of the pulse following muscular exeration in the clonic phase. The shock can be repeated a few minutes after an abortive attack. Further studies are being made to perfect technic and to provide for all danger sources. No deaths have occurred, nor are late ill effects noted. The clinical results are encouraging and not inferior to those obtained with cardiazol.

The marked disadvantages, that is, mental panic apprehensions and dread of the treatment, for the most part are lost in the unconsciousness, retrograde, amnesia and willingness to continue and cooperate at each visit.

In this series of cases which began January 17, 1941, to April 15, 1941, 41 patients were treated. Ages varied from twenty to sixty-six years. The number of shocks given were 347; duration of illness was from two weeks to eight years.

Illnesses classed in the group were involutional melancholia, manic depressive depression, schizoid reactions, pananoid personalities, toxic, manic reaction type, and malignant dementia praecox cases.

The results obtained in this series showed that 3 males and 12 females recovered; 1 female in remission; 2 males and 3 females were stationary.

The Physiological Conception and Treatment of Certain Common "Psychoneuroses." Edmund Jacobson.

Am. J. Psychiat. **98**:219 (Sept.) 1941.

Without attempting to compare results of different forms of therapy, every effort is made in the physiologic study and treatment of "psychoneuroses" to avoid methods of suggestion, of psychoanalysis and of other forms of psychotherapy. According to evidence to be recounted, treatment of the "psychoneuroses" can be accomplished effectively if progressive relaxation is employed, provided that the patient attends and practices as instructed. It is possible for the physician to prescribe, in addition to progressive relaxation, sedatives, change of occupation or of scene, diet, exercise, psychiatric methods or other procedures. However, according to the author's experience, the more such methods are omitted the more the patient is trained to rely on his own physiologic training. A more nearly permanent favorable result would seem to come from the use of progressive relaxation alone than from mixed forms of treatment.

As a rule, he is requested to continue at the daily work or occupation in the same manner as before treatment. If he has smoked, used alcohol, tea or coffee, he is instructed to make no change in these habits. The instruction, "No change" applies to exercise or lack of it as well as to diet. In the event that his nervous state has apparently been aggravated by some person, factor or phenomenon in his daily work, play or home environment, no attempt is made to alter his life in this respect, but he is encouraged to learn to relax in the face of the difficulties encountered, so that he may live with them rather than escape from them.

Abstinence from polytherapy marks the foundation stone of scientific therapeutics. Similarly in every other department of biology the same underlying principle has been observed (since the time of Mill) when investigators arrange the conditions of any scientific experiment.

Accordingly, medicinal or vitamine or dietetic remedies are so far as possible to be omitted altogether. However, if the patient has been chronically addicted to the use of sedatives, it is a part of the aim of relaxation treatment to render such measures unnecessary.

The physiologic method includes general as well as differential relaxation in which the patient is taught to recognize and to relax minute as well as gross tensions, constant or fleeting. Each patient who can give the time required is trained by the method of autosensory examination to observe for himself what takes place during mental activities. Specific training is required for him to be able to observe and to describe the experiences during the phobias, anxieties or other pathologic mental processes to which he has become habituated. This takes time.

Having learned to observe, the patient is prepared to relax the tensions during these processes. Electrical measurements of states of

neuromuscular tension are made before as well as during and after treatment, since they furnish objective records of progress.

Electrosurgery (Electrocoagulation, Electrodesiccation) as an Adjunct to Radiation Therapy in the Treatment of Cancer. George E. Pfahler and David A. Sampson.

Am. J. Roentgenol. **46**:302 (Sept.) 1941.

Electrosurgery has a definite field of usefulness as a supplementary measure in the radiation treatment of many benign and malignant lesions.

Electrocoagulation can be used to advantage in all such lesions which involve the skin or visible portions of the mucous membranes. This will include all warts, moles, hyperkeratoses, superficial fissures or ulcers involving the skin, all localized patches of leukoplakia, fissures, sluggish ulcers, papillomata or polyps involving the mucous membrane of the mouth, the nose, the vagina, the rectum or the uterine cervix.

The technic for the destruction of these small superficial precancerous lesions of the skin is relatively simple, but we have seen instances when it has been badly done. Local anesthesia (novocaine) is suitable in nearly all instances. Each lesion must be anesthetized separately and sufficiently, otherwise the pain prevents complete destruction. The desiccating current should be used for these small lesions. It should be a fine spark and should be done slowly so as to be sure to get all of the lesion but not to destroy healthy tissue unnecessarily. The destruction must always extend beyond the actual disease. It is our custom to curette away the desiccated or coagulated tissue. If such curetting reveals a bleeding base it indicates that the desiccation must be carried out more deeply. The scar even of these benign lesions can be improved by a local application of 80 to 100 per cent of an erythema dose of roentgen rays or radium. We are of the opinion that electrodesiccation increases the sensitivity of malignant cells to a greater degree than the production of such an effect in the normal cells, and that thus selective value of irradiation is enhanced.

Neurologic Aspects of Spasticity and Athetosis. Tracy J. Putman.

New York State J. Med. **41**:1822 (Sept. 15) 1941.

Paralysis and other disorders due to disease of suprasegmental long spinal tracts and higher structures are often grouped together as "cerebral palsies" or "spasticity," when, as a matter of fact, the variety of physiologic conditions that may exist alone or in combination is enormous. In discussing paraplegia the author reminds us that when the spinal cord is abruptly divided (for example, by an acute thrombotic transverse myelitis or following a fracture of the spine), the phenomenon of "spinal shock" occurs. The treatment of spinal shock consists mainly in preventing infection. The care of the extremities during this period consists largely of preventing foot-drop or other muscular lesions, of the use of a cradle, and of massage to maintain the nutrition of muscles. If the transection of the cord is complete, the legs are usually relaxed except when some trifling stimulus—such as is produced by stroking the skin—reaches the isolated spinal segment, when a "mass reflex" occurs. Often, however, a variable number of fibers still pass the site of injury. The condition of the muscles varies, but they are often constantly or intermittently in a state of strong contraction, which opposes voluntary movement or produces athetoid tremors.

Referring to hemiplegia and monoplegia the author states that injury to the pyramidal tract anywhere in its course produces a hyperreflexia. Whether or not there is a superimposed rigidity depends upon factors that are obscure. With or without it, the condition is usually called "spasticity," even though the extremity may be entirely relaxed in certain positions.

In the acute, flaccid stage, the patient can sometimes be "reminded" how to use his extremities by a session or two of faradic stimulation. Aside from this, electrical stimulation is wholly useless in the treatment of suprasegmental paralysis. The patient should be encouraged to practice using the extremity and should be given some occupational therapy that will use his remaining powers to their best advantage. Massage should be avoided after the stage of shock, since it tends to arouse proprioceptive reflexes. Passive motions, carried out slowly so as not to be stimulating, should put the joints through a full range of motion daily.

Rigidity differs from hyperreflexia or spasticity by the fact that there is a constant innervation of both agonists and antagonists, which are practically never at complete rest. Rigidity is seen in its purest form as a part of the parkinsonian syndrome. It may be associated with birth injuries or other diffuse lesions of various types. Therapeutically, the problem is chiefly one of relaxing spasm, since strength is often well preserved. Physical therapy and psychotherapy do not seem to accomplish much.

Athetosis is a syndrome consisting of involuntary, irregular, slow, squirming movements of one limb appearing in an adult after a hemiplegia. Physiologically, the squirming and intermittent rigidity is produced by irregular, variable contractions of many or all of the muscles of an extremity, sometimes one and sometimes another predominating. The central mechanism is obscure, but it seems fairly clear that the abnormal impulses do not utilize the pyramidal tracts exclusively (perhaps not at all), for the dyskinesia may occur even when there is a complete loss of voluntary control, and, anatomically, a degeneration of the pyramids may be found.

Attempts at treatment of athetosis and dystonia, considered hopeless until recently, are now proceeding in three directions. Retraining and careful minute instruction in walking and the use of the hands often produce considerable improvement, chiefly in the milder cases. Attention to providing special chairs, tables, typewriters, etc., may make a great

difference in the patient's comfort. The use of drugs of the curara series have aroused interest. There has been progress in surgical treatment.

Syphilis. Review of the Recent Literature. Charles F. Mohr; Paul Padget; Richard Hahn, and Earle Moore.

Arch. Int. Med. 69:470 (March) 1942.

Ewalt and Ebaugh have undertaken the long term comparative evaluation of artificially induced fever by mechanical means and inoculation malaria by the only method which offers any prospect of giving a definitive comparison, i. e., the unselected assignment of alternate patients to one or the other method of treatment. They present the results of a five year study of 232 patients with dementia paralytica, half of whom have been treated with artificial fever and the remainder with inoculation malaria. The follow-up treatment was as nearly identical as could be gained in the face of the vagaries of clinical practice. The authors summarize their results as follows:

The method of therapy with artificial fever has been safer and has been productive of better results. The importance of follow-up care is emphasized. Improvement in the care of patients during malaria therapy and more attention to follow-up medication has improved the results of malaria therapy in our clinic, though these results still remain inferior to the results obtained with artificial fever therapy.

Patients with physical contraindications to therapeutic malaria may in many instances be safely treated with artificial fever therapy. Either method is reasonably efficient if properly managed and if general follow-up treatment and care are adequate.

The serologic responses roughly parallel the clinical results in the two series. Careful, periodic, clinical reexamination offers the best guide for therapy and gives the most reliable data for evaluation of results.

The Cooperative Clinical Group have analyzed the records of patients with dementia paralytica treated with malaria or artificial fever and summarize their observations as follows:

This study evaluates the clinical and serologic results obtained in paresis with artificial fever as compared with malarial therapy. There were 1,100 patients treated with malaria and 320 treated with artificial fever. Throughout the study the data are presented in terms of degree of involvement of paresis on beginning fever therapy. Patients with "mild paresis" were relatively free of deterioration and their mental symptoms were usually transitory. Patients classified as having "intermediate paresis" exhibited symptoms of manic excitement, depression or other psychiatric syndromes, in addition to evidence of moderate deterioration. Patients with "severe paresis" gave evidence of advanced deterioration.

Under either method of fever therapy the earlier in its course the paresis was treated, the more favorable were the results of therapy. The chances of clinical remission in patients with mild paresis were approximately 1 out of 2; in patients with intermediate paresis, 1 out of 4 and in patients with severe paresis, 1 to 10 out of 100. Clinical responses to either type of fever therapy were similar in patients with mild or intermediate paresis on beginning fever therapy. However, this similarity disappeared when treatment was administered to patients with severe paresis. In fact, the remission rates for patients with severe paresis treated and observed for the same length of time was 1 out of 100 under malaria, as compared with 10 out of 100 under artificial fever. Approximately 90 per cent of the total clinical remissions obtained under either method of therapy occurred by the end of the third year of treatment-observation. The degree of paretic involvement on beginning fever therapy influenced the frequency and the speed of expected remissions. Clinical remissions were obtained one to two years earlier in patients with mild paresis than in those with intermediate or severe paresis. Once a complete remission had been obtained, the chances of its being maintained under either method of fever therapy were 95 out of 100. In a total of 17 relapses, 15 occurred within 3 years subsequent to the year of remission. Relapses were more frequent in severe paresis than in mild or intermediate.

Reversal rates for originally positive spinal fluid and blood reactions increased as the duration of treatment-observation increased. Blood as well as spinal fluid reversal-rates were at least twice as great with as without the use of auxiliary chemotherapy. Among patients not treated with auxiliary chemotherapy 42 per cent of all spinal fluid reversals subsequently relapsed, as contrasted with only 24 per cent spinal fluid relapses among patients treated with auxiliary chemotherapy. Two-thirds of all the relapse from spinal fluid reversal occurred within one year following the original reversal. Reversals of both blood and spinal fluids were associated more than twice as frequently with clinical success as with clinical failure. However, since clinical success was not accompanied by complete reversal (blood and spinal fluids) in 52 per cent of cases, it follows that clinical success was not necessarily dependent upon serologic reversal. Reversal of the spinal fluid was more important than reversal of the blood in indicating the chances of complete clinical recovery.

The high percentage of clinical remissions was obtained in patients treated with an average of sixty-nine hours' fever above 101 F. (38.3 C.) of which total fever-time 70 per cent was at a level above 105 F. (40.6 C.) with a maximum temperature of 106.9 F. (41.6 C.). Equally good results were obtained in patients treated with an average of forty-four hours of fever above 101 F. (38.3 C.) of which total time 57 per cent was above 106 F. (41.0 C.) with a maximum temperature of 107 F. (41.7 C.). The authors are of the opinion that fever administered at levels above 106.5 F. (41.4 C.) is hazardous.

Unfortunately, much of the value of this article, especially in a comparison of patients with so-

called "severe" dementia paralytica, is lost because of failure to take into account the all-important factor of duration of symptoms of the disease before the institution of one or another type of fever therapy.

Influence of Temperature on Sulfathiazole Therapy of Gonococcal Infections. Frederik B. Bang.

J. Urol. **47**:299 (March) 1942.

The use of the chick embryo as an experimental host for gonococci allows an in vivo study of chemotherapy at different temperatures. It is noteworthy that not only is therapy more effective at temperatures above 37 C. but it is less effective below.

The demonstration of the relation between temperature and effectiveness of sulfathiazole therapy suggests a clinical application of combined heat and drug therapy.

However, not only a highly effective but a short period of treatment is desirable. For this reason a small series of hospitalized male patients with acute gonorrheal urethritis was treated for five days with the usual dosage of sulfathiazole combined with either diathermy or "hot box." Eleven patients were given a temperature of 104 to 105, for about four hours in a Kettering hyperpyrexia machine. Higher temperatures were avoided. Eleven other patients received diathermy combined with sulfathiazole. Short wave diathermy was applied directly over the pubis for approximately one-half hour twice daily. In both groups all therapy was stopped at the end of five days. Patients were observed for at least a week following and were considered cured if the discharge had completely ceased, the urine was clear, the smears negative and the prostatic cultures negative. The urine usually was not completely clear until a day or so after treatment had been stopped. Two of the patients in the diathermy series and one of the hyperpyrexia series were not cured in this time.

Sulfathiazole alone, number of patients, 25; number of failures, 10; percentage cured, 60.

Sulfathiazole combined with heat, number of patients, 22; number of failures, 3; percentage cured, 86.

Electrosurgical Removal of Plantar Warts. Florentine L. Karp, and Samuel B. Frank.

Arch. Dermat. & Syph. **45**:328 (Feb.) 1942.

The article calls attention to a method of removing plantar verrucae. The technic is not complicated and requires equipment which is found in most dermatologic offices and clinics. It does not incapacitate or cause postoperative discomfort to the patient. Little or no scar tissue results when proper technic is employed.

The cutting current from a spark gap, high frequency apparatus is employed. The indifferent electrode of ordinary diathermy metal approximately 12 inches (30 cm.) square is placed under the fully clothed patient. The active electrode is made by twisting a stock 8 mm. steel wire loop so that the remaining loop is 2 mm. in diameter.

With a continuous motion the loop is rotated 180 degrees on its own axis (a half-turn) and then is withdrawn from the same linear opening that was made when the loop was embedded in the tissue. By this rotating movement the essential part of the wart is destroyed. Owing to a slight coagulation of the blood vessels, no bleeding occurs and after the electrode is removed only a linear incision the width of the loop is observed on the surface. The wound is painted with tincture of iodine, followed by the application of alcohol and a dry dressing.

The authors believed that results with this procedure are more nearly ideal than with any other form of treatment, since postoperative discomfort and formation of scar tissue are reduced to the minimum and the technic is simple. They report a percentage of cures in 21 cases of 90.48.

Diagnosis and Treatment of Cancer of the Larynx. Arthur E. Hammond.

Arch. Otolaryng. **35**:1 (Jan.) 1942.

New said that he treats an early chordal lesion by laryngofissure with wide removal and destroys the base by means of diathermy. More advanced lesions with some limitation of movement of the anterior two-thirds of the vocal cord, he said, are removed and the cartilage and the base are destroyed by means of diathermy. In patients in whom the anterior commissure is involved, he considered the possibility of the lesions extending through the cricothyroid membrane. He treats these by wide removal, including the anterior portion of the thyroid cartilage. The patient has a patent airway and an acceptable voice. Laryngectomy is performed in all cases of intrinsic cancer of the larynx in which conservative removal does not permit of a sufficient margin of safety.

Resocialization: The Aim of Therapy for Psychotic Patients. George L. Mosby.

M. Bull. Vet. Admin. **18**:290 (Jan.) 1942.

The term "occupational" therapy, which has been in use so many years to denote that form of empirical treatment most universally used in the care of mentally ill patients, does not seem to the author to be well chosen. The term has a tendency to narrow one's concept of the purpose of the therapy, with the result that mere occupation of patients is deemed by many to be all that is necessary for their treatment.

In order, then, to make everyone who is connected with a mental hospital feel that he or she is an essential factor in the treatment of the patient, a broader designation of therapy seems necessary. "Resocialization Therapy," or a designation similar thereto seems to the author better suited to convey the aim of the treatment for mental disorders.

Heat Exchanges During Recovery From Experimental Deficit of Body Heat. E. A. Pinson, and E. F. Adolph.

Am J. Physiol. **136**:105 (March 1) 1942.

Heat exchanges were measured in four men who sat unclothed in air at 31 C. and 25 per cent relative humidity. In each test the body became cooler by 0.72 calories per kilogram when 1.5 liters of ice water were drunk. The mean heat content was estimated from the temperatures of many regions of the body at various times thereafter. In 200 minutes, 85 per cent of the initial heat debt was paid off. Half of the heat regained came from the reduction in loss by vaporization of water. The other half came from the reduction in loss by radiation and convection, concomitant with the diminution of surface temperatures.

Heat produced by oxidation was not augmented. No shivering occurred. At a lower environmental temperature (28 C.) the recovery was slower. It was noted that the heart frequency was diminished after ice water was drunk, and that the ensuing water diuresis was sometimes delayed.

Training and Its Effects on Man at Rest and at Work. C. A. Knehr; D. B. Dill, and William Neufeld.

Am. J. Physiol. **136**:148 (March 1) 1942.

A group of fourteen subjects followed a training regimen for middle-distance running over a period of six months. The men were studied before and during this period at rest and while doing two grades of work on a motor-driven treadmill. The training regimen was accompanied by a slight increase in weight, a decrease in resting pulse rate of five beats per minute, a slight decline in the respiratory rate and volume and a slight increase in plasma chloride. No significant differences were found in alveolar carbon dioxide, alkaline reserve, metabolic rate, hemoglobin or the formed elements of the blood, all being measured in the resting state. An increase in efficiency of grade walking was observed. In exhausting work there was an increased capacity for supplying oxygen to tissues and greater utilization of anaerobic energy reserves. The work increment unaccounted for by these alterations presumably results from a more economical organization of bodily functions. The increased capacity for accumulating lactic acid that is developed during training and the notably high lactate levels attained by first class athletes point to this determination as a useful index to cardiovascular fitness.

Some Orthopaedic Procedures Employed in the Treatment of Arthritis. John Bastow.

Proc. Roy. Soc. Med. **35**:80 (Dec.) 1941.

A series of six cases of ankylosing spondylitis was shown to illustrate the benefit gained, even in very long-standing cases, by the following regimen: (a) complete rest in a plaster shell; (b) gradual correction of kyphosis by adding thin layers of padding under the dorsolumbar junction and subtracting similar layers of padding from under the head, to increase extension in the spine; (c) deep-breathing exercises practiced constantly while the patient is lying in a plaster shell; (d) daily physical therapy; (e) the fitting of a Goldthwaite spinal brace to maintain the position of maximum correction that has been obtained.

The improvement was manifested in all patients by alleviation of symptoms, improvement in posture and increased chest expansion.

A patient with arthritis of the tarsal and metatarsal joints received relief of symptoms by the application of a plaster boot.

A series of six cases of spondylitis ankylosans was shown to illustrate the routine of treatment carried out at the Royal National Hospital for Rheumatic Diseases.

All patients on admission are supplied with a plaster bed, which extends from the vertex to the sacrum in cases where the disease is confined to the spine itself and extending to the knees or mid-calves in patients where the hips are affected.

Each patient is encouraged to lie supine in his shell for as long as possible, with the aid of regular sedatives, until, in a very short time, he spends the whole of the twenty-four hours in his plaster, except for the period during which he is undergoing physiotherapy. Gradual improvement of posture is obtained.

Thin stripes of woolen material are inserted under the spine, wherever the ankylosis is not complete and especially at the dorsolumbar junction. By this means, a surprising amount of correction of the kyphosis can be obtained within a few weeks and the chest expansion improves considerably.

Persistent local pain in resistant conditions is treated by the application of deep roentgen therapy, when ordinary physical therapy fails to bring relief.

When it is judged that the maximum degree of correction in a particular condition has been obtained, the patient is fitted with a Goldthwaite spinal brace and allowed up for gradually increasing periods. He spends the night in the plaster shell and takes it home with him, with instructions to continue its use until long after all symptoms have disappeared and to return to its use at the first sign of recurrence of pain or increase in deformity.

Stimulation of Cells by Intense Flashes of Ultraviolet Light. E. Newton Harvey.

J. Gen. Physiol. **25**:431 (Jan. 20) 1942.

A study has been made of the effect of sudden intense flashes of ultraviolet light, acting on a wide wariety of cells and tissues, with special reference to stimulation. The flashes are obtained by a high voltage condenser discharge through a quartz mercury vapor sterilamp, using the method of Rentschler. The lethal effect of a single such discharge is widespread among unicellu-

lar organisms. Medullated nerves and whole muscles are not visibly stimulated, because of absorption by connective tissue. Single muscle fibers undergo immediate contracture in 50 per cent of the experiments. Nitella cells are stimulated, the effect depending on the dosage. Weak ultraviolet flashes slow or stop cyclosis reversibly. Strong flashes stop cyclosis reversibly with the appearance of a local or a propagated action potential. Strong flashes kill the Nitella cells. The effect of single flashes on myonemes, oscillatory movement, ameboid movement, cilia, flagella and bioluminescence is described.

Variations in Electroencephalogram Associated With Electric Shock Therapy of Patients With Mental Disorders. B. L. Pacella; S. E. Barrera, and L. Kalinowsky.

Arch. Neurol. & Psychiat. **47**:367 (March) 1942.

A group of 61 patients receiving electric shock therapy at the New York State Psychiatric Institute and Hospital were studied electroencephalographically. Over 350 records were obtained on this group. Records were taken immediately after individual shocks, resulting either in "petit mal," or "minor," seizure response or in the generalized seizure response. In addition, the records were obtained at various stages during the course of treatment and at various intervals after cessation of the course of therapy, up to a period of six months.

Patients subjected to the "petit mal," or "minor," seizure type of treatment by the electric shock method exhibited only temporary and transient changes in their electroencephalograms taken immediately after administration of the shocking currents. Large series of the "petit mal" type of treatments alone did not produce appreciable alterations in the electroencephalographic patterns, which persisted for a period exceeding twenty-four hours. In none of these instances was the "spike and dome" pattern, as described in cases of epilepsy, evident.

Patients subjected to the generalized convulsive seizure or to a series of generalized convulsions exhibited fairly marked changes in their electroencephalographic patterns, resembling in type those observed after convulsions produced by other means or occurring spontaneously. The larger the series of treatments administered, the more pronounced became the abnormalities and the greater the duration of time for which these abnormalities persisted.

In general, the electroencephalographic abnormalities associated with electric shock treatments are for the most part "reversible" in the sense that they gradually disappear. It should be stressed that this does not necessarily imply that any concomitant functional or histopathologic disturbances which may occur as a result of the treatments are also correspondingly "reversible."

Combined Artificial Fever, Chemotherapy, and Vaccinotherapy in the Treatment of Neurosyphilis. Three and One-Half Years' Report. Albéric Marin.

Am. J. Syph., Gonor. & Ven. Dis. **26**:234 (March) 1942.

The routine of treatment was: At 7 A. M. the patient received an injection of an arsenical drug and was immediately given a session of five hours of artificial fever at 105 F. On the third and fifth days he was given an injection of a fever-producing vaccine (such as pyrifer) and of bismuth. The vaccines caused an average temperature of 104 F. The procedure was repeated for ten weeks, over which period the patient received a total of fifty hours of artificial fever at 105 F., 10 injections of an arsenical drug and 20 injections each of vaccine and of bismuth. Treatment was then continued in the out-patient department with a pentavalent arsenical or neoarsphenamine and with bismuth.

The hyperthermal cabinets utilized for the production of weekly hyperpyrexia permit the attachment of a short wave apparatus, if desired.

Artificial fever therapy combined with chemotherapy, and using vaccines as an adjunct to the mechanical hyperpyrexia has been given to 265 patients, with no deaths. The details of the treatment are given.

In general paresis, 46 per cent of the patients obtained a complete remission. In tabes, several cases were definitely improved.

Of 173 patients who received one complete course of hyperpyrexia, vaccines, and chemotherapy, the spinal fluid became immediately negative in 6 cases (4 per cent).

Of 84 patients who subsequently received twelve months of chemotherapy (following artificial fever), the spinal fluid became negative in 17 per cent.

Of 34 patients who received twenty-four months of chemotherapy, following the hyperpyrexia course, the spinal fluid became negative in 18 per cent. Three of 9 patients treated for three years have developed negative spinal fluids.